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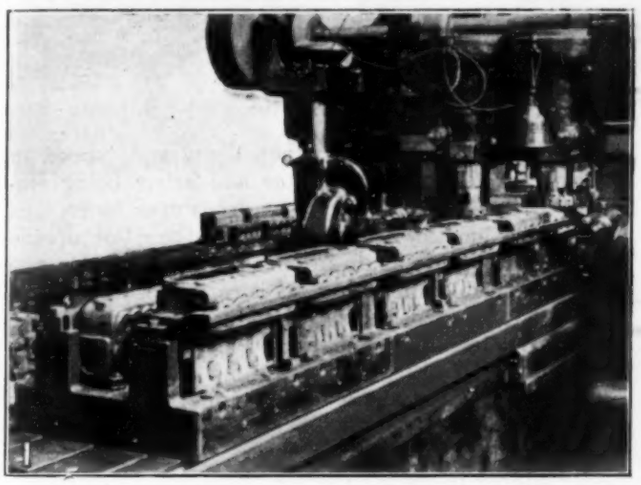
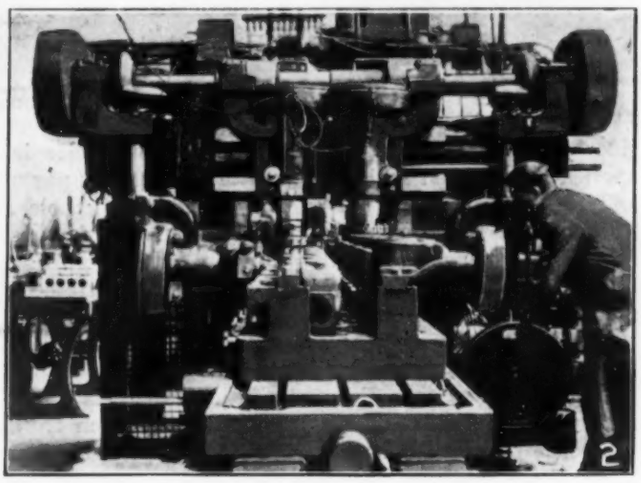
Machining the "Bean" Motor Cylinders

Methods Used in a Well Equipped English Motor Plant—Cylinders Produced on American Machine Tools—A Power Washing Machine

By I. WILLIAM CHUBB
Editor, European Edition, *American Machinist*

PROBABLY the most completely equipped factory in Great Britain for the production of motor car chassis is that at Tipton belonging to A. Harper Sons & Bean, Ltd., a group which has its own iron foundry adjoining, with body-building factory at Dudley arranged on much the same general plan, a stamping works at Smethwick, while the steel needed, the aluminum, radiators, etc., are provided by associated firms. The factory at Tipton has an area of about 1,231,000 sq.ft., the adjoining iron foundry adding 68,000 sq.ft. covered, with yards making a total of 122,000 sq.ft. while the body factory at Dudley has a site of about 682,000 sq.ft. At Tipton are the administrative offices in a two-story building 225 x 44 ft. Everywhere in the works roller conveyors and moving trucks are used, from the taking in of supplies to the complete assembling of the chassis in a shop which is 450 ft. long by 90 ft. wide. Even the messenger lads have been provided with roller skates. In fact, generally speaking, in mechanical means employed the Tipton factory is almost unique in England.





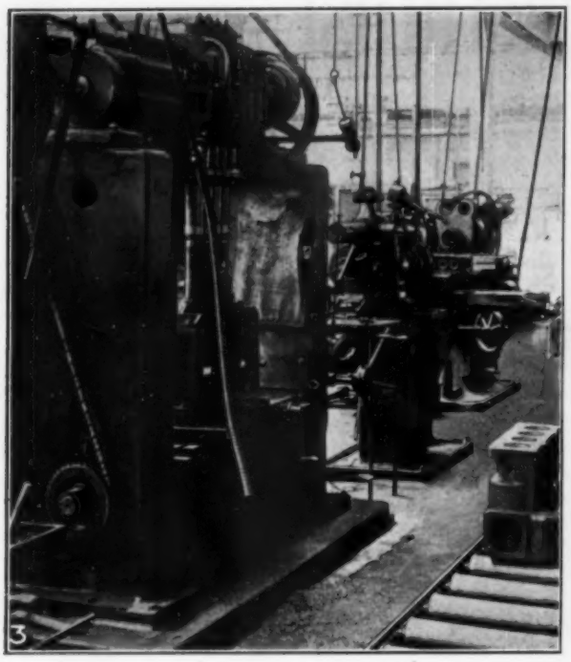
FIGS. 1 AND 2. GANG MILLING ON AN INGERSOLL MACHINE

In the machine shop the line system of grouping tools has been very extensively—in fact almost exclusively—followed, but in the present article only the cylinder-production methods are dealt with, and almost the complete line of machines for this, is shown in the illustrations. The cylinders are of cast iron, the bores being 69 millimeters.

The first operation on the cylinder blocks is that of milling on an Ingersoll milling machine, as illustrated in Figs. 1 and 2, twelve blocks being milled simultaneously in two rows each of six components. In this way after the first loading six cylinder sets are completed on each pass of the table. On the left-hand side the set of castings, as dressed, lying on their backs, are located on pegs bearing rough facings. Machined on the crankcase and inlet and exhaust manifold faces, they are then turned over to the other side of the machine table to deal with the top, the inspection cover and valve spring faces, the faces produced in the first half of the operation acting as registers. Thus four milling cutters are used (three with inserted blades,) to produce four faces, two on a side. Three cutters are of face form and one is a left-hand spiral, left-hand cutting end-and-face mill. Fixed setting stops are provided on the jigs as shown, and 0.01-in. feelers are used for all setting points. The cylinder then goes to a Milwaukee milling machine for machining the fan bracket and the accelerating pedal bracket faces, the fixture employed indexing around on a vertical axis for this purpose, the pedal bracket face being done first. A cut straight across is taken in each case by means of an inserted-tooth side and face cutter. Next held in a vise the job is taken to a Le Blond milling machine to deal with the plug hole faces by means of an end mill with right-hand cutting, right-hand spiral teeth. The process may be gathered from Fig. 3.

For rough-boring a Moline No. 5-D machine (see also Fig. 3) is employed, the casting being located against the crankcase face throughout, with datum positions from one end and one face against stops.

The casting is slipped on a special fixture which, by a compensating link motion acting on plungers, lifts six plungers independently until all have forced the cylinder into place, its crankcase face bearing under the bridge piece of the fixture and the job being clipped



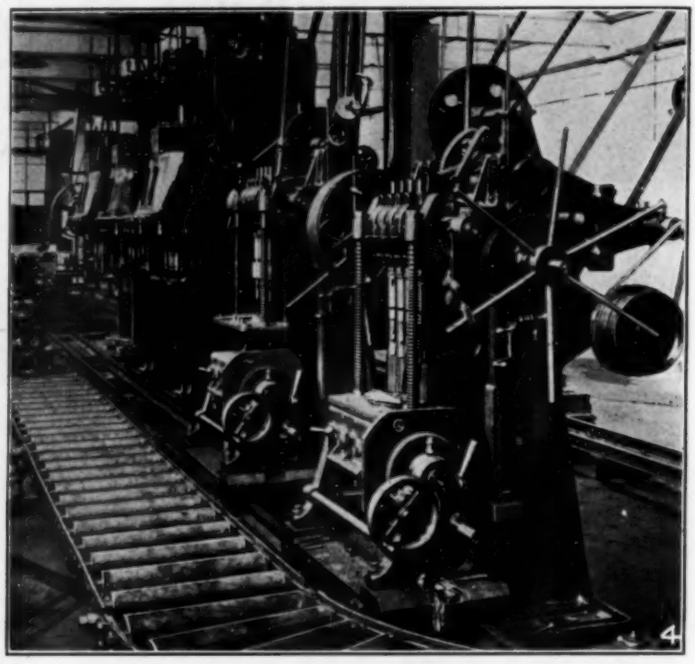


FIG. 3. ROUGH BORING CYLINDERS. FIG. 4. JIGS ON THE TRUCK LINE

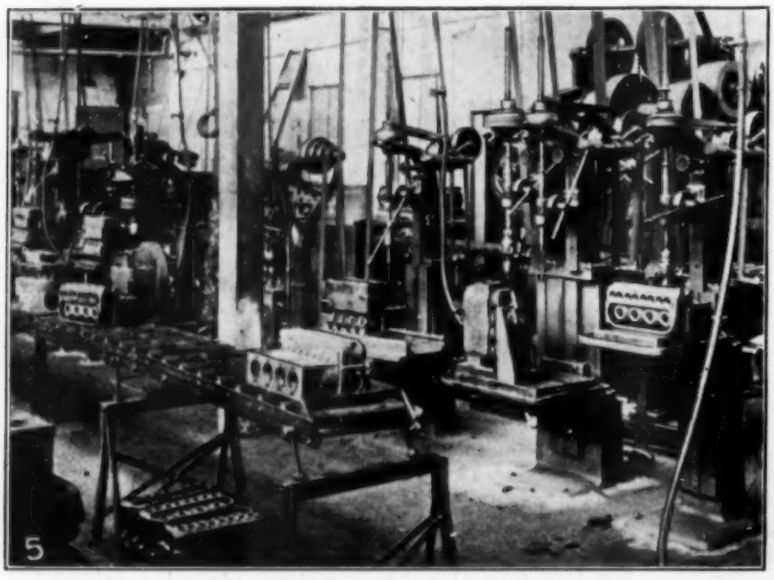
sideways and also from the front. To this device is applied an air blast which blows into the exhaust parts and forces chips, etc., out of the cylinder plug holes. This type of jig is also used for the semi-finish reaming. For boring and facing the top of the cylinder bores three cutters are employed, let into the bottom of a bar and adjusted for diameter by the cone head of a screw which expands the set, each cutter being locked in position by a grub screw at the side. The toolholder itself is tenoned into the end of the boring bar and secured by a screw, and the boring bar is driven from the machine spindle by keys, one on each side. The table of the machine rises and falls and in one cut the rough-boring takes the holes from the cored stage to within 0.045 in. of finished size.

The water test follows, the pressure employed being up to 100 lb. This test takes place immediately after rough-boring to save machining leaky cylinders.

The water plug holes are then bored and tapped in a Sibley machine, a shell cutter and arbor being employed for the boring. The work drops over four plugs which have bushed holes into which the pilot of the cutter enters. Here again for the locating positions, the exhaust manifold faces and accelerating pedal bracket faces are used and it may be added that all cutters are secured by bayonet slots and are therefore easily removed.

The cylinder bores are then chamfered in a Sibley geared-head machine. The work is clipped on the fixture, dropping on two bungs in the cylinder plug holes, the jig sliding in ways on rollers.

Up to this point the cylinder has been moved from machine to machine along the roller line, but in subsequent operations it is secured in a truck jig on rollers, which runs on a rail system and is illustrated in Fig. 4. With the cylinder in a trunnion jig, loaded square with



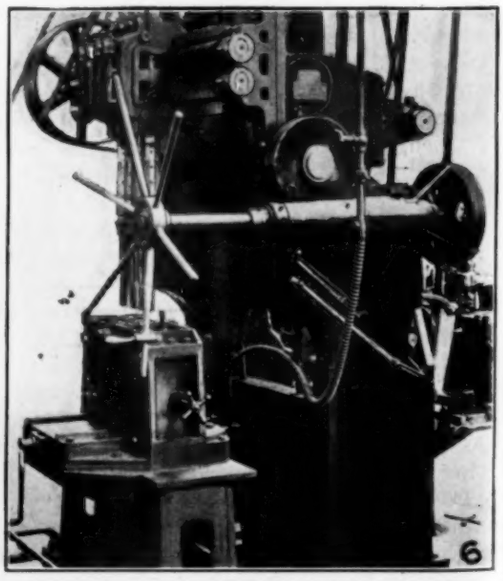


FIG. 5. MISCELLANEOUS DRILLING OPERATIONS. FIG. 6. SEMI-FINISH AND FINISH BORING CYLINDERS

the line, the truck is pushed from machine to machine along the rails, turntables being provided at ends of track for return of trucks via the back of machines. The first of these operations is boring the inlet and exhaust valve holes, counterboring and recessing in a Moline machine No. 61, combination shell cutters being used. The truck jig floats on ball races and the truck itself is roughly located by means of pedal catch to within say $\frac{1}{16}$ in. Then heavily tapered dowels in the jig enter dowel holes in the bush plate, which is carried on the machine and held down by springs on to the jig for final position. In this machine two sets of cutters are used, roughing and finishing, slipped on and off four spindles and producing holes for eight valves for the two positions of the truck, four alternates being dealt with at a time. The truck is then moved to Natco machines No. 13 for drilling inlet and exhaust manifold faces and three inspection cover stud holes, thirteen holes in all, the job being located as before, in the jig, which revolves on the trunnions to the required position. Next, under a Natco No. 13 machine, the five bolt holes are drilled for securing to the crankcase, and under a Moline No. 5 tapping machine, inlet and exhaust valve holes are tapped for the plugs. Inserted blades are used, and the taps float, lead being provided on top of the spindle, which is reversed by belt motion. This is the last operation on the truck line, which is fairly completely illustrated in Fig. 5, the job moving from right to left.

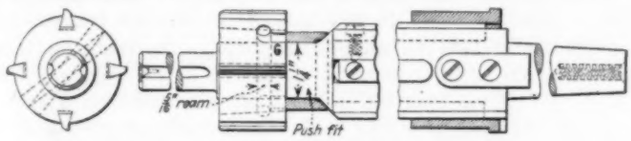


FIG. 7. SEMI-FINISHING REAMER

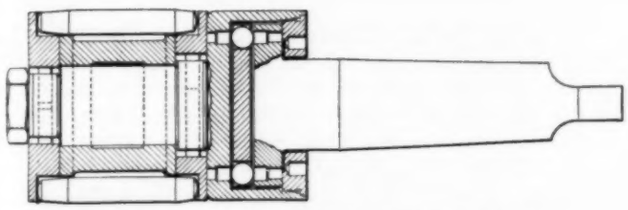


FIG. 9. DETAILS OF THE ROLLING TOOL

A number of minor operations follow, including tapping the inlet and exhaust manifold faces and the inspection cover stud holes in a single-spindle Herbert drilling machine, this operation being the first of those illustrated in Fig. 5, where the cylinder is shown lying on the table of the machine at the extreme right-hand side. The cylinder then passes to a two-spindle Herbert machine where, mounted in the jig shown, the water plug holes are drilled and tapped, a three-lipped core drill being employed for the drilling. A single spindle Herbert upright drilling machine then drills and reams the valve stem holes, the tools being held in a Gronkvist chuck, a pilot bush inserted in the plug hole being employed. The work then passes to a Barnes drilling machine with four-spindle head, where it is drilled for the accelerator pedal and fan faces, the work being slipped on the jig and located in the cylinder bolt holes which have already been drilled. The two ends are drilled with the work in the same jig, which swings, as illustrated, on a horizontal axis. The holes in these faces are then tapped in a Garvin machine, being held

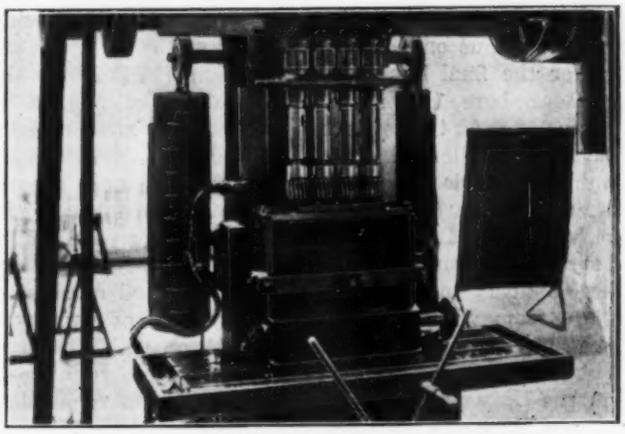


FIG. 8. ROLLING THE CYLINDER BORES

exactly as for drilling. Then valve stem guides are broached by means of an arbor press on a stand, 0.002 in., being left in by reamer for broaching, the job being dropped on the bolt hole face for the eight positions. For facing the valve seats the cutter locates itself in the bore already put in as the first of the truck operations, and the cylinder plug holes inside the bores are countersunk by an ordinary cutter, this operation being followed by spot-facing the bolt holes in a Herbert vertical drilling machine.

The semi-finish reaming for cylinder bores (Fig. 6) which follows, is done on a Moline machine No. 66-D, using piloted bars and a jig similar to that used for the rough-boring. To prevent seizing only four bearing strips, two long and two short, are employed on the bar held by screws. Further, under the pilot plate is a cavity into which air is blown from the back of the machine inwards to keep the dust away from the bar. A four-bladed reamer is employed, the blades being a tight fit in dove-tails which are taper 3 deg. at the back for adjustment (see Fig. 7). Eight thousandths of an inch is left for the finish-reaming, which follows by means of a six-bladed reamer. This is not piloted in the jig but permitted to float, leaving 0.0005 to 0.001 in. for the rolling, which is also done in a Moline machine, type 2-D.

The drive to the finish reamer is much as described later in relation to the roller head. Made from $\frac{3}{8}$ x $\frac{1}{2}$-in. steel, the actual cutters are each $1\frac{3}{8}$ in. long, with a rounded front or entering end and a slight cutting lip. The land is $\frac{1}{64}$ in., clearance for the center being stoned

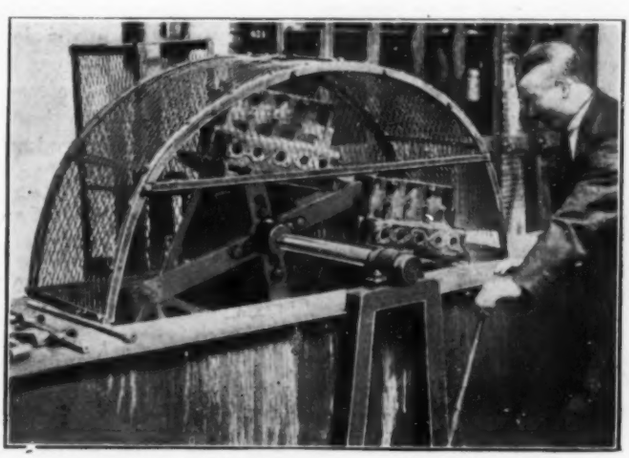


FIG. 10. WASHING THE CYLINDER BLOCKS

off. Each set of blades is good for sixty bores, allowing plus or minus one half-thousandth.

For the final burnishing operation (Fig. 8) on the cylinder bore the roller head shown in Fig. 9 is employed. At the lower end will be seen a set of $\frac{3}{8}$-in. cast steel rollers, hardened and ground, fourteen in number, carried between two hardened and ground rings which are slightly recessed for the ends of the rollers; the latter having spherical seats and being barreled by about 0.015 in. in diameter on the operative length of $1\frac{3}{8}$ in. The roller end is carried on a body piece from which it is driven by means of two cross pegs at each end. The central bush on which the two rings supporting the rollers are carried is a running fit on the body piece, but the end rings have some play. Between the latter and the flanged end of the shank entering the machine spindle is a set of eight balls to take the end thrust, and the drive between the shank and body is by means of an Oldham coupling device, $\frac{1}{16}$ in. of flat, not wobble, float being permitted. The rollers are arranged to have 3-deg. left-hand spiral lead when assembled. This system has displaced grinding.

Two minor milling operations follow, namely, milling the connecting-rod clearance, the cylinder being held in an index fixture which gives four positions, the corners of the clearances being milled in a Milwaukee machine. Finally the cylinder is washed (see Fig. 10) in a tank of soda water, heated by burners, cradles for the cylinders being carried through the bath on four arms driven by worm gearing.

Economic Conditions in Switzerland

Unfortunate Situation of a Small Neutral Country Surrounded by Belligerents—Exchange and Dumping Difficulties—Labor, Raw Material and Food Problems

By Dr. WALTER E. BOVERI
Brown, Boveri et Cie., Switzerland

MUCH has been said and written about the economic troubles of the belligerent nations, but little is heard of the almost equally hard position of some of the neutrals, particularly Switzerland. The Swiss Republic, bounded by four big nations all of which have been engaged in the war, with insufficient resources to produce her own food supply, besides having no raw materials of her own, depends for her existence entirely upon foreign trade. Under the circumstances, free trade is the only feasible commercial policy; but at the same time it is obvious that a country entirely dependent on its foreign trade is bound to be severely affected by the depreciation of the currency of its former customers, as well as by the high tariff walls by which even the strong commercial nations have surrounded themselves recently. As a result, business conditions are very bad in Switzerland, two of the most important industries, the watch and the lace industries being entirely shut down. Huge sums have to be paid by the government to support the ever increasing number of unemployed.

The depreciation of foreign currency produces similar effects to those created by high tariffs, only in a much stronger degree. There are two sides to the matter; the first and more important is, that the manufacturer cannot compete any more with countries with a low exchange, and it is evident that a country that lives by foreign trade, like Switzerland, is bound to be very much affected by this situation. On the other hand, the Swiss market becomes flooded by foreign products which can be sold at a much lower price than the home-made articles, so that the Swiss manufacturer has even to fight for the home market.

It has, therefore, been suggested several times to depreciate the value of the Swiss franc by issuing a larger number of bank notes. Fortunately, the advocates of this scheme have not been successful. One has to bear in mind that the effects of a low exchange are caused by the difference between the purchasing power of the depreciated currency at home, and the rate at which this currency is exchanged for other currencies abroad. As soon as these two valuations are equal all bad effects upon foreign trade will disappear. It is obvious that the smaller the country in question and the more intensely it is engaged in foreign trade, the more rapid will be the adjustment. Switzerland has nothing to hope from a depreciation of its currency as the only effect this could bring about would be a raising of the cost of living and wages, without giving any stimulus to the exporting manufacturer.

Speculative Investments

The depreciation of the currency of our neighboring countries has had other effects, too. To create an outlet for the national products, Swiss bankers and manufacturers have invested their capital in foreign countries, and these investments were made in the form of par value. With the decrease of the value of the foreign exchanges, some of these investments were partly, others (as in the case of Russia, Austria and Germany) almost entirely lost. As long as the political and economical uncertainty prevails it is not likely that Swiss capitalists will re-invest their money in foreign countries, though before the war this had proved to be a most efficient means to stimulate foreign trade.

Another very bad effect of the exchange situation has been the inducement it created to speculate in foreign money. Unlike the speculative fever in Germany and Austria (which is founded on a more or less sound argument, namely, to invest liquid funds in shares which are backed by some real value not effected by exchange fluctuation, and which has driven the prices of stocks to an unprecedented level at which they hardly yield anything), the speculation which we encounter in Switzerland merely rests on the feeling that one day the foreign exchanges will have to come back to their par level. Chiefly, people with insufficient knowledge of the underlying principles, as for instance the small employees and peasants, have engaged in these speculations and the sums they and the country lost ran into many millions.

It may be asked why under all these unfavorable conditions the value of the Swiss franc never more seriously depreciated. Besides a 60 to 70 per cent cover

of gold for the outstanding notes, this can only be accounted for by the fact that Switzerland has a very favorable balance of payments. When during the war the Swiss franc always kept its high level (even the dollar toward the close of the war sank for a time to about 75 per cent of its par value in Switzerland), many foreigners thought it advisable to open accounts with Swiss banks. This was also done to avoid taxation, and since then a steady influx of money into Switzerland has taken place. For some reason or other, however, these large sums may be called back at any moment and therein lies the danger of the present situation.

As far as labor troubles are concerned, it may be said that the recent period has brought very satisfactory changes. The revolutionary wave of 1918 has entirely passed owing to the energetic opposition it found from the peasants who all own the land they cultivate. Besides, the working man realized that under the unfavorable industrial conditions, the times for wage increases have passed and that all he can hope for is not to lose his job. However, there have not been any substantial wage reductions due to the fact that wages of the men employed by the state and the federal railways are fixed by law and can only be altered by legislative action, a very remote possibility. The same applies to the eight-hour day which is also a legal standard, and from which productivity has immensely suffered.

Switzerland and American Markets

During the war, when Russia stopped supplying us with grain and not sufficient coal and iron could be obtained from Germany, we turned for these supplies toward the United States. However, these trade relations did not develop as we hoped they would. Switzerland cannot buy here unless she has a chance of selling her products in this country. The United States is commercially the strongest nation today and could accordingly adopt a free trade policy without the slightest risk, in my opinion. The American manufacturer would be sufficiently protected by freight charges and by the fact that a foreign product always encounters a stronger resistance. The present tariff laws, however, prevent our products from finding a market here and, therefore, it is not likely that we shall be in a position to buy large quantities of American goods.

Though in general our economic situation may be subject to some fluctuations, no recovery is possible while the causes of the crisis remain. Russian food supplies and purchasing power, which went far to support the people and factories of Europe, are gone not to return for many years. It took France a decade to recover from her revolution. Will it take less for Russia to come back?

The dismemberment of the Austro-Hungary empire, while it may have been expedient politically, was an economic crime which will bring its retribution on the countries that formerly traded with Austria. Small countries, economically unsound, always cause many troubles.

The German reparations will never be paid; it is economically impossible to do so. Some of the wiser heads predicted the situation which is now upon us, but no one yet seems to have found a cure. Over everything broods the spectre of uncertainty, in politics as in trade, and while it lasts recovery will be very slow.

A Letter From Chile

By Harry S. Thomas

Why is the United States machinery trade with South America, particularly Chile, declining? A major cause is that representation is left to the people here, who are more interested in selling a case of salmon, tea, sugar, or some such commodity, than in talking about the advantages of buying mechanical contrivances. Nor are they properly prepared to sell machinery, because they are purely office people. Other causes are neglect in dispatching orders, and the substitution of inferior articles. Again, one is visited by a traveling salesman who cannot speak Spanish, and who knows nothing of the people who handle his goods, nor of the transportation difficulties.

To my mind what is wanted, and I speak from a master mechanic's viewpoint of 20 years' experience, is representation by master mechanics who know, and who are known to, all the people here. That would go a long way in recommending machinery and requisite accessories. Powerhouse specialties, mining equipment, railroad accessories, water line fittings, shop tools and machines, oil burning equipment, hardware—in fact all things pertaining to the metal trades where a mechanical working knowledge is necessary, should be represented by the class of men spoken of. One man could represent a small group.

The usual method followed here is for some house, upon request, to become an agent. However, no push is put in and one has to be a miner to dig down and find out who has the machinery he wants. Advertising is not practiced except by a few of the largest concerns.

Care should be taken to give the representative a good salary, office quarters in the right spot, traveling expenses and the usual out-of-pocket. Men can be found right here who are in touch with the buying people, through social intercourse and who can give every attention to the article sold.

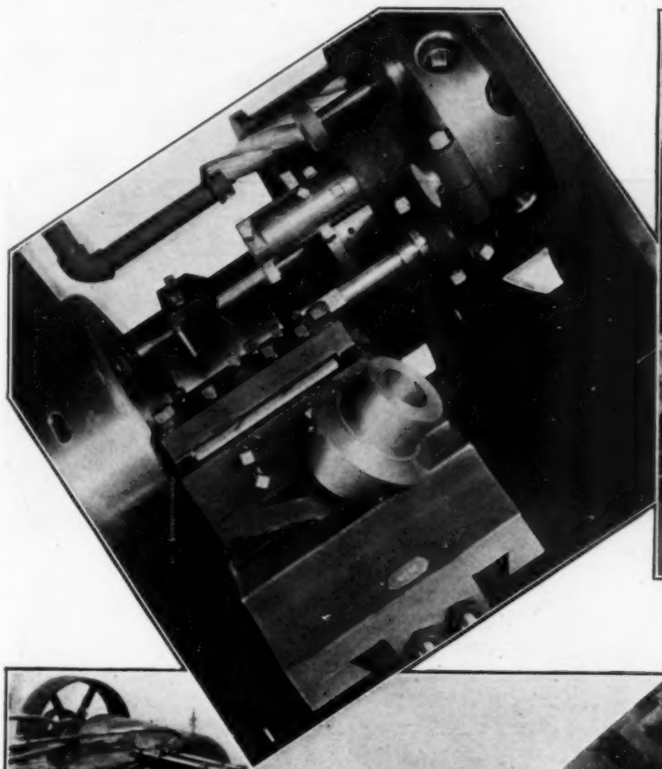
Think what it means to a man stuck away up on the mountains to find it necessary to make a week's trip when he wants a spare part. Conditions should be such that a telegram to his distributors would get it in half the time.

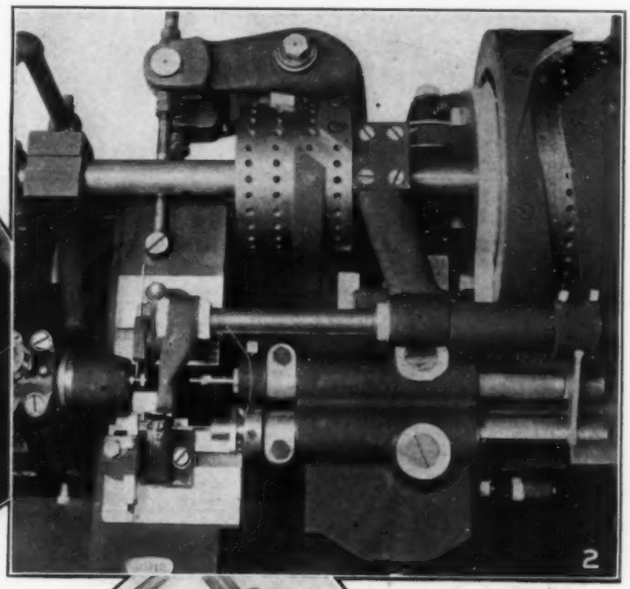
PRODUCTION

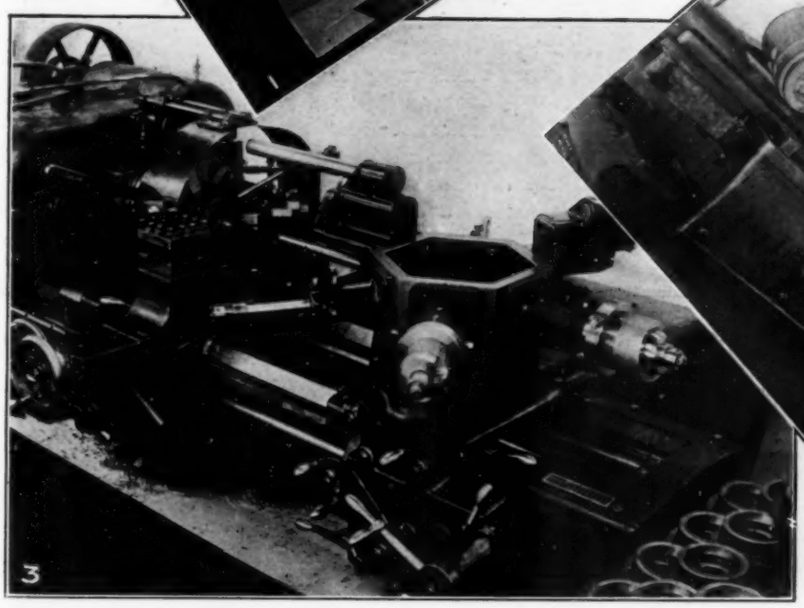
Figs. 1 and 2. Two operations on part of a roller bearing for a Timken axle are shown while being done on 8-in. Bullard mult-au-matics. This installation is a good example of high efficiency in all factors of cost. The machine on the first operation was in production 92 per cent, and the one on the second operation 93 per cent of the possible total time. On a 30-day run, no machine adjustments were made on the second machine. Careful inspection showed 100 per cent perfection of the work from the first machine and 99.86 per cent perfection from the second machine. To fully appreciate the vast strides made in production by this type of machine, one must see it in actual operation.

Fig. 3. In this illustration there is shown a large battery of Bullard vertical turret-lathes in the machine department of a steel foundry. The wheels shown, both on the floor in the foreground and in process on the machines, are regularly finished at the rate of 36 per day per machine.

IN PICTURES







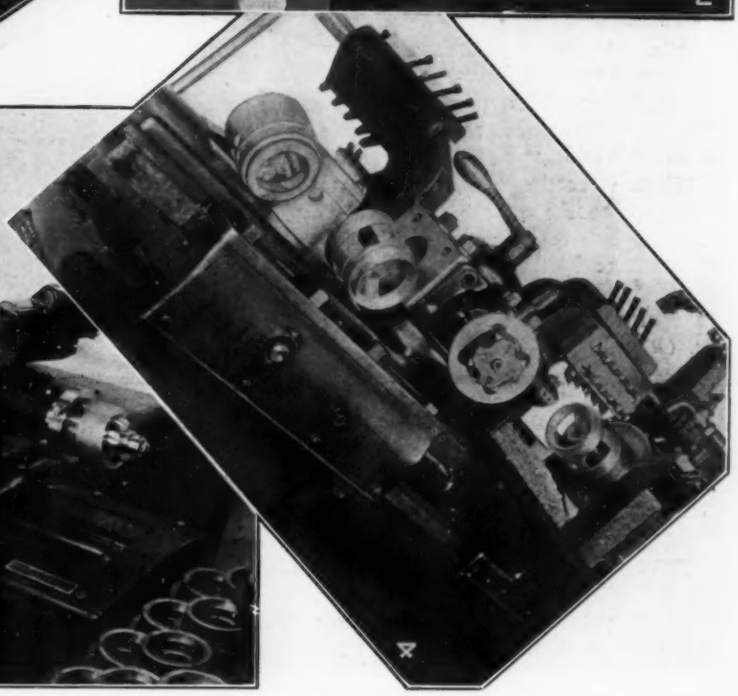


Fig. 1. Producing bevel-gear blanks from a 6-in. bar of steel is a husky job for an automatic screw machine. The motor-driven Cleveland automatic shown herewith turns out such blanks in 22½ min. each. If made under older methods the time required would be very materially increased.

Fig. 2. Here is a Cleveland automatic of a smaller size turning out 800 pieces per hour. The material is brass rod and the product is spark-plug nuts. A much smaller quantity would be considered fast production on a hand-operated machine.

Fig. 3. Differential housings for automobiles require several operations for completion. The illustration shows a Foster universal turret-lathe machining housings in 2½ min. each. The modern turret lathe has made possible the production of such work in very brief time.

Fig. 4. The screw machine of today with its automatic selective-stops and its multiple tooled carriage is a hog for work. Here is shown a Foster screw machine turning out patented aluminum pistons at an up-to-the-minute quantity rate.

PRODUCTION

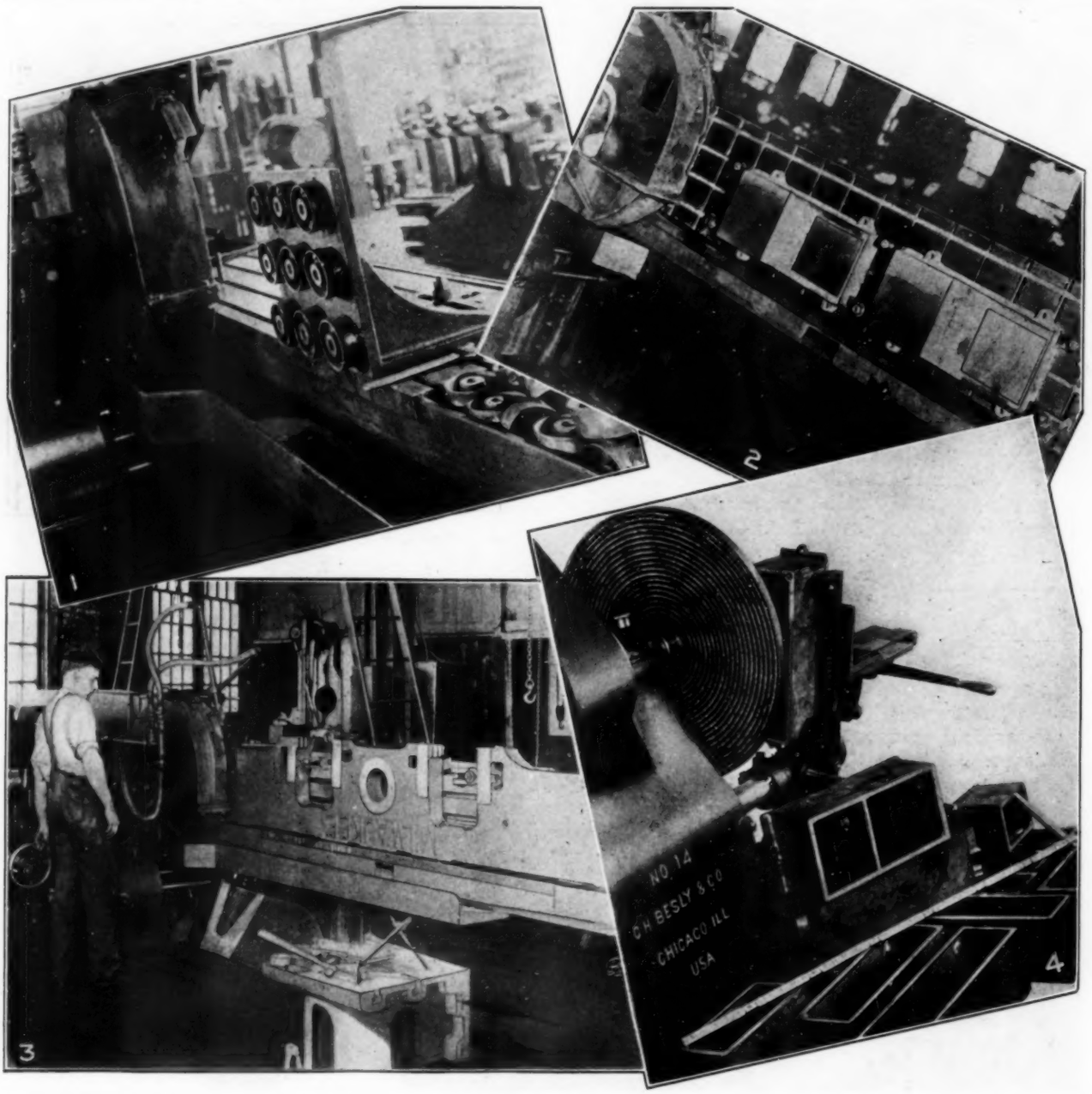


Fig. 1. Surface grinding as a production machining operation is of comparatively recent date. The illustration herewith shows the sides of pulleys being ground on a Diamond heavy-duty face-grinding machine in batches of nine. One-sixteenth inch of metal is removed from each side of the pulleys and the time from floor to floor is 5 min. for the lot.

Fig. 2. Bases for centrifugal pumps are being ground on this Diamond heavy-duty machine in 5 min. each. The material is cast iron and the amount of metal removed is $\frac{1}{4}$ in. The planer must take a back seat on quantity work of this character.

Fig. 3. Here a real planer job is being done on a Diamond heavy-duty grinding machine. Notwithstanding that $\frac{1}{4}$ in. of metal must be removed from each side, the floor to floor time for grinding a pair of these frames on both sides is $2\frac{1}{2}$ hr. This work was formerly done on a planer and required $6\frac{1}{2}$ hr. per pair.

Fig. 4. Comparatively large work is being machined on the Besly disk grinding-machine shown in the illustration. The castings are held so as to float against the disk and are finished by unskilled labor at the rate of 50 per hr. or eight times faster than the previous time on a milling machine.

IN PICTURES

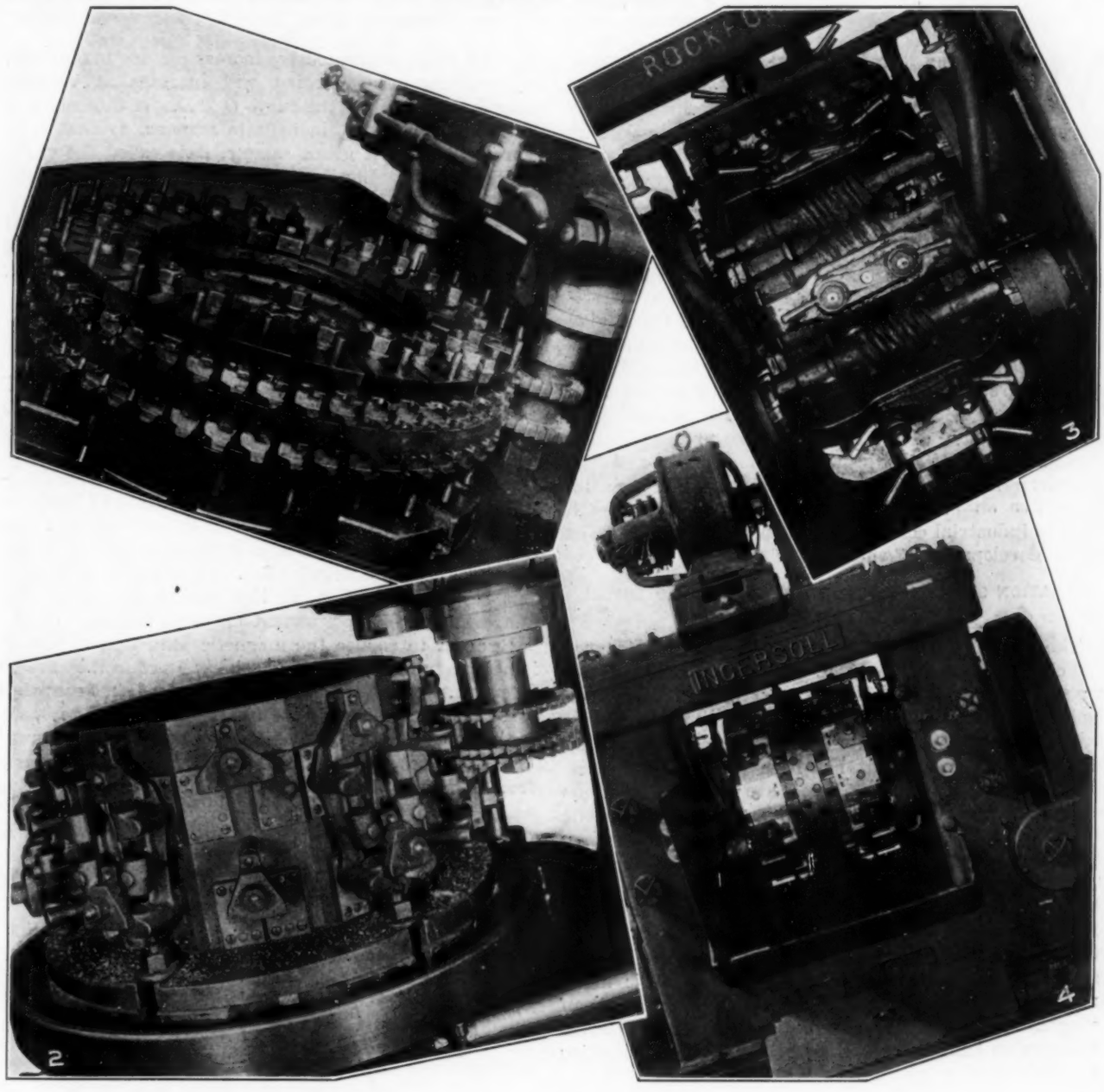


Fig. 1. The use of a revolving table provided with multiple fixtures has greatly increased the production capacity of the milling machine. As some of the fixtures can be loaded und unloaded while work in others is being operated on, the production is practically continuous. This illustration shows a Newton vertical double-spindle continuous milling machine roughing and finishing gear shifter forks. The fixtures hold 100 pieces and the production is 240 pieces per hour.

Fig. 2. The fixtures on this Newton machine hold 22 brackets for valve rocker-arms in which three bosses on each are to be faced on both sides. As the bosses are not all in alignment, two operations are necessary. Three faces are machined in one operation and the work is then reversed for milling the other three faces in a second operation. The production is 35 pieces per hour.

Fig. 3. The drum-type machine with horizontal spindles is particularly adapted for milling both ends of pieces too long to be straddle milled. The Ingersoll drum-type machine with its four spindles is here shown roughing and finishing both ends of worm shafts at the rate of 75 per hour.

Fig. 4. In addition to milling long work in both ends, the drum-type machine is well adapted to milling shorter work on one end by double ganging as shown in this illustration. Here an Ingersoll machine is milling the ends of 376 connecting rods per hour.

Magnetic Analysis of Steel

Uses of Electric Current for Inspection—Apparatus and Method of Operation—Relation of Magnetic to Mechanical Properties of Steel—Advantages and Difficulties

By R. L. SANFORD
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MANY physical and chemical methods for testing steel and steel products destroy the sample or render it unfit for the use for which it was originally intended. This fact has made necessary our present methods of vicarious testing. It is plainly evident, therefore, that any satisfactory non-destructive method which makes possible the comparison of each individual piece with one whose performance has been carefully determined and which thus serves as a standard of equality will have great commercial value.

Various non-destructive methods have been investigated by physicists and engineers, but none give greater promise of ultimate success than those of magnetic analysis. So great are the apparent possibilities in this direction that the United States government, through the National Bureau of Standards, is making as thorough a study of the subject as the present limited appropriations of the Bureau will permit, and the American Society for Testing Materials through its committee on magnetic analysis is co-operating with various industrial concerns and educational institutions in the development of this type of testing.

Relation of Mechanical to Magnetic Properties of Metals

The mechanical properties of steel are functions of its chemical composition, its micro-structure, and its mechanical condition. The micro-structure and mechanical condition, such as internal strain, etc., are determined by the thermal history and the amount and kind of mechanical work that has been done on the piece. The magnetic properties of steel are likewise functions of the same variables and any change produced in one set of properties is accompanied by a corresponding, though not necessarily proportional, change in the other. These facts constitute the fundamental basis upon which the science of magnetic analysis is being developed. Magnetic analysis may be defined then, as the utilization of magnetic methods for the study of the internal structure and mechanical condition of magnetic materials, particularly of iron and steel. The methods of magnetic analysis may also be used to detect internal changes on heating or cooling or even as an indication of mechanical properties.

Magnetic Properties of Steel

Whenever a piece of steel is subjected to the influence of a magnetic field, such as exists within a coil of wire, or solenoid, carrying current or between the poles of an electromagnet, it becomes magnetized and the degree of magnetization varies according to the strength of the magnetizing field. Although the mode of variation of this magnetization with the magnetizing force is regular and characteristic, still no satisfactory mathematical relationship between them has yet been established.

The characteristic relationship between the magnetization of steel and the magnetizing force producing it is shown graphically in Fig. 1. If a previously neutral or demagnetized sample of steel is subjected to a magnetizing force continuously increasing in magnitude, the resulting magnetization will increase at varying rates as indicated by the curve *O T D*. If this curve is determined in a certain definite manner, so that it is reproducible for a given sample, it is called the curve of "normal induction." The unit of magnetizing force (H) and the unit of magnetization or magnetic induction (B) are called the "gilbert per centimeter" and the "gauss" respectively. The ratio of corresponding values of magnetic induction and the magnetizing force, $\frac{B}{H}$, is called the magnetic "permeability."

Secret of Permanent Magnetization

If from some point on the induction curve, such as *T* in the figure, the magnetizing force is decreased, the induction does not follow the curve *O T D* in the reverse direction but "lags" behind as indicated by the curve *T R C*. This lagging of the induction behind the magnetizing force is called *hysteresis*. When the magnetizing force has been reduced to zero there remains a certain induction as at point *R* on the curve. This is called the "residual induction" (B_r). It is the existence of this residual induction, or the phenomenon of hysteresis, which makes permanent magnets possible.

In order to reduce the magnetic induction to zero it is necessary to apply a magnetizing force in the reverse direction. The value of the reversed magnetizing force required to bring the induction down to zero, i.e. to the point *C* on the curve, is called the "coercive force" (*HC*). If the magnetizing force is varied continuously from a maximum positive value to an equal negative

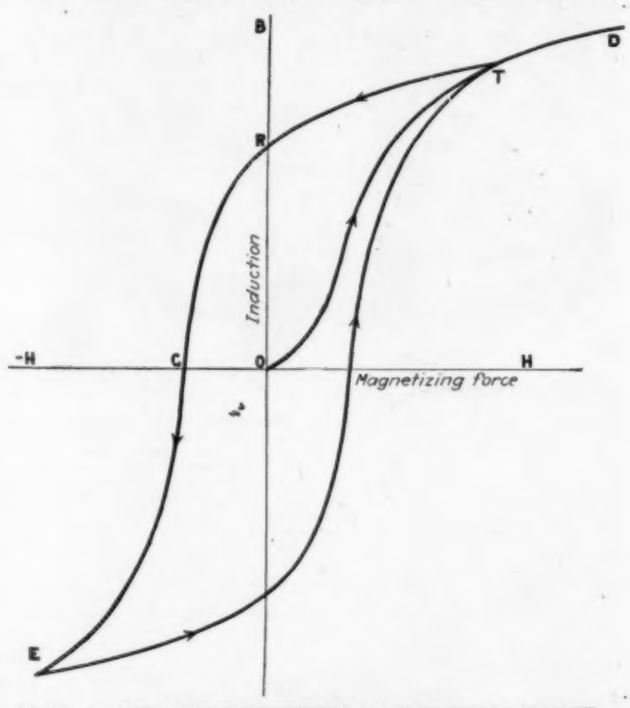


FIG. 1. RELATION BETWEEN MAGNETIZING FORCE AND MAGNETIZATION

value and back again to the same maximum positive value a closed loop (*T R C E T*) is obtained which is called a hysteresis loop. The point *T* whose co-ordinates are the corresponding values of maximum magnetizing force (H_m) and maximum induction (B_m) is called the "tip" of the loop. In giving values of B_r and H_c for any given material either the H_m or the B_m from which they were determined should always be specified.

These magnetic relations are definite and characteristic for the various compositions and kinds of metals; thus their measurement is of importance.

The photograph Fig. 2 shows the standard permeameter of the Bureau of Standards with which precision measurements of these magnetic properties of samples of iron and steel are made.

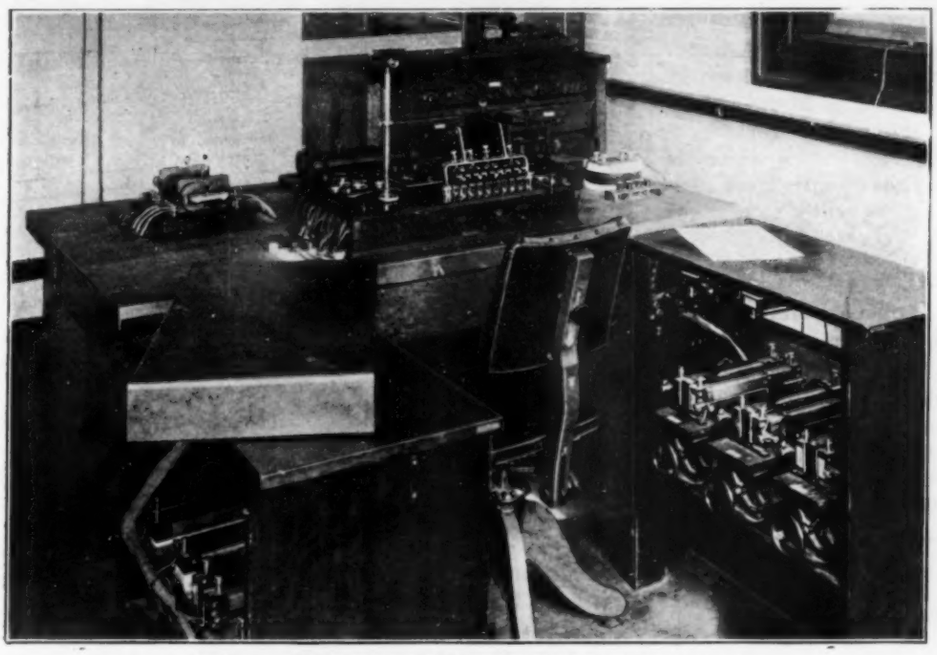


FIG. 2. BUREAU OF STANDARDS PERMEAMETER

The methods of magnetic analysis may be employed either by the investigator, as an aid in the solution of theoretical problems such as those arising in the study of the phenomena involved in the hardening of steel, or by the testing engineer as a non-destructive method of test to supplement the methods now in use for many iron and steel products. However, many fundamental investigations are still necessary before the methods can be fully used either for the study of various changes occurring during the heat-treatment of steel or for the collection of data on the relation between the magnetic and other physical properties of steel.

Any such study of the relation of the various properties is usually best carried on with specially prepared samples upon which accurate measurements of both mechanical and magnetic properties can be made. This is especially important in order that the work of various investigators can be compared. An example of this type of work is an investigation carried out some time ago at the Bureau of Standards on the properties of a 1 per cent carbon steel such as that sometimes used for springs. A description of this work is not necessary, but the curves of normal induction shown in Fig. 3 as taken from the report of this investigation are interesting to give some idea of how clearly the effect of variations in heat treatment were shown by the magnetic properties of steel of this composition. A still better idea of the abrupt changes in magnetic properties due to variations in heat treatment is given in the curves of Fig. 4 which show some results obtained on steel of slightly lower carbon content (0.85C). It is not difficult to see how such striking results can be used to distinguish between metals which have been differently treated.

Data of the type just described show the conditions existing *after* the sample under investigation has been cooled to room temperature. It is possible that much more information could have been gained as to the changes which took place during the heating or cooling if observations on the magnetic properties had been taken while the temperature changes were taking place. Some work of this kind has been done in other countries, but little if any in the United States. As can well be understood, such tests are difficult to make.

The results of investigations of the kinds just described are susceptible to many methods of interpretation and one of the problems as yet unsolved is to find the best methods of expressing the results so as to indicate most clearly the relationship between the various properties. While the evidence already at hand is sufficient to demonstrate that there is a very strict correspondence between the magnetic and mechanical properties of steel, these relationships are so complex that up to the present time no definite laws have been worked out. Indeed it may prove extremely difficult, if not impossible, to completely define in terms of the magnetic properties of a substance all of its other physical properties or vice versa. In spite of this apparently discouraging fact, we need not wait for the complete working out of all the correlations before applying magnetic analysis in a practical way.

For practical purposes, magnetic analysis has as its

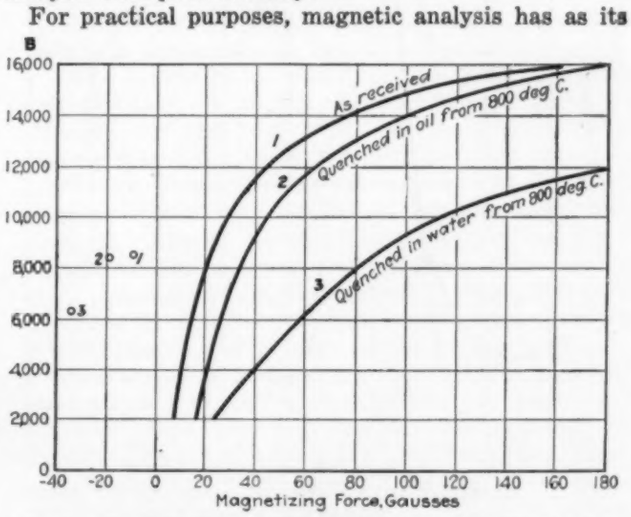


FIG. 3. EFFECT OF VARIATIONS IN HEAT TREATMENT

ultimate object the development of methods and instruments which can be used in the shop for the purpose of comparing the factory product with specimens which have been selected as standards of quality. At the present stage of development, each application must first be the subject of an individual investigation. The properties of the material must be studied, the magnetic criteria for quality must be determined upon and apparatus must be built for making the magnetic measurements quickly and accurately under shop conditions. After these steps have been completed, the final step is trial under actual service conditions to demonstrate whether the method is sufficiently rapid, accurate and reliable to warrant its commercial use.

For the examination of fabricated articles many different types of apparatus will be required. Odd shapes give extreme difficulty in the accurate determination of their magnetic properties. Fortunately, however, for purposes of comparison and routine testing, very accurate values are not necessary. Apparatus which is capable of yielding reproducable results with good comparative accuracy should be entirely satisfactory for this purpose.

Practical Application of Theory

One method which has been applied to the study of ball bearing rings is illustrated in Fig. 5. The ring is mounted on a table free to rotate and magnetized between the poles of an electromagnet which also rotates about the same axis. The rotation of the ring is opposed by a spiral spring. By means of a pointer and scale the torque exerted on the ring by reason of the rotation of the electromagnet can be measured. This

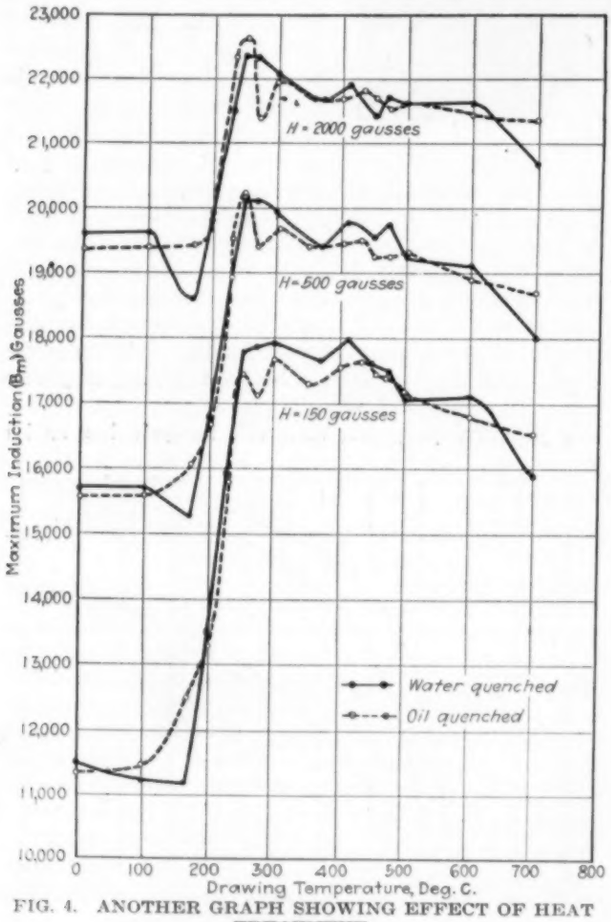


FIG. 4. ANOTHER GRAPH SHOWING EFFECT OF HEAT TREATMENT

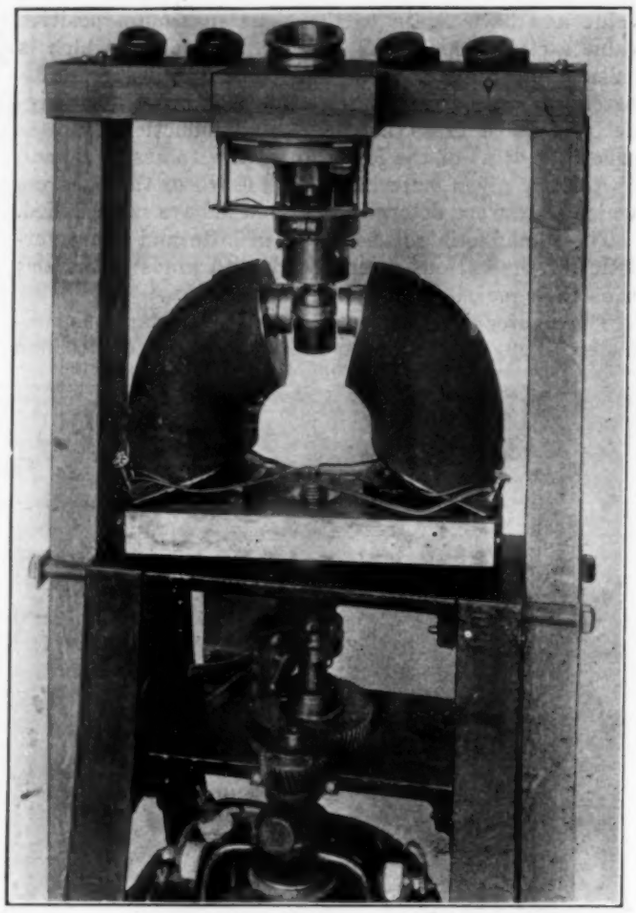


FIG. 5. METHOD OF STUDYING BALL RACES

torque is proportional to the energy required to carry the direction of magnetization of the ring through one complete revolution. It seems probable that this value may be used as an index in testing the rings. If the needle jumps during the rotation a crack or soft spot is indicated. The cracks shown by the pieces of a broken ring in Fig. 6 were detected in this manner. Unfortunately this investigation was interrupted by the war and has not been carried on to a practical conclusion, but very promising results may ultimately be expected.

Various investigations are now under way on the practical application of magnetic analysis to the testing and study of various products such as twist drills, chain, welded pipe and raw materials. Besides the testing of such materials for their general properties it is possible in some cases, such as the ball bearing rings just mentioned, to detect the presence of hidden flaws and imperfections as evidenced by variations in magnetic permeability.

This requires the method which has been developed for determining the degree of magnetic uniformity along the length of a specimen of a substantially uniform cross-section.

The apparatus for this test is shown in Fig. 7. It consists of a magnetizing coil through which the bar to be tested is driven by means of a set of rollers. Within the solenoid are mounted test coils which are connected to a sensitive electrical instrument. If the bar is uniform there will be no deflection of the instrument when the bar is moved through the coil. Any variation from uniformity, however, causes a deflection of the instrument. These variations in magnetic properties

may be the result of any one of a number of causes. There may be chemical segregation in the bar; there may be mechanical strains; or there may be flaws or other mechanical imperfections. Any one of these conditions will be indicated by the apparatus. It is possible by moving a photographic film in front of a spot of light reflected from the mirror of the instrument to obtain a photographic record showing the degree of uniformity of the bar. Fig. 8 shows one example of the kind of flaw that may exist in the interior of a bar of steel. This flaw was detected by means of a magnetic test.

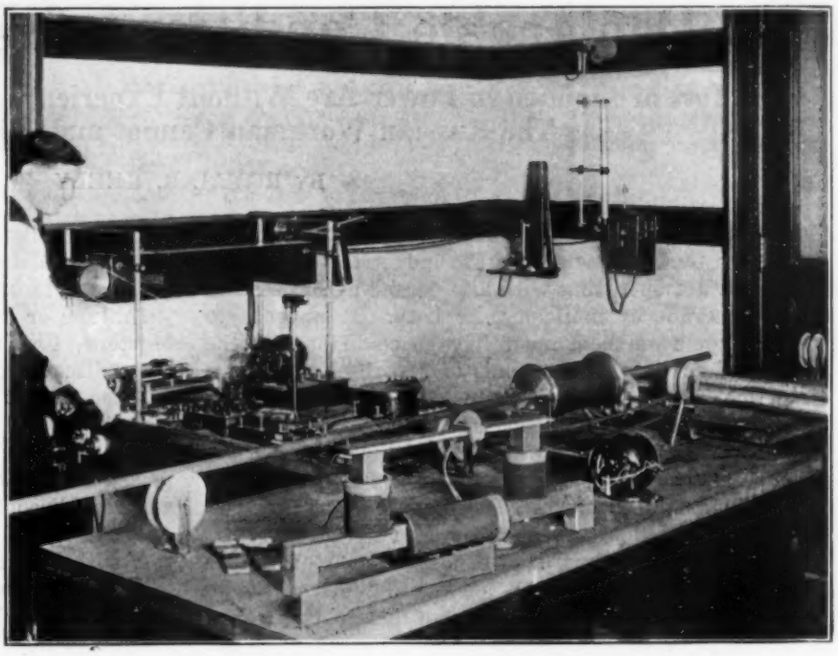


FIG. 7. APPARATUS FOR TESTING BARS OR PIPES

The greatest difficulty in this line of investigation lies in the interpretation of the results. This is due to the fact that there are many causes which may produce magnetic inhomogeneity, such as chemical segregation, strains and flaws, and it is difficult to differentiate between them. The conclusions so far warranted are: (1) A bar which is magnetically uniform along its length is also mechanically uniform; (2) a bar which is mechanically non-uniform along its length is also magnetically non-uniform and this non-uniformity will be surely indicated by the test; (3) bars which are magnetically non-uniform may or may not be seriously defective from the mechanical point of view.

Investigations are now being carried out with the end in view of distinguishing if possible between the effects of various conditions in the bar which give magnetic differences so as to avoid the acceptance of material which is really faulty, or the rejection of material which is for all practical purposes entirely satisfactory.

Limitations of Magnetic Testing Show Need of Research

The foregoing rather brief discussion of magnetic analysis is not presented as a comprehensive treatment of the subject. It is hoped, however, that enough of an idea has been given to show that magnetic analysis has great promise and should develop into a powerful tool in the hands of the metallographer for the solution of many of the complex problems encountered in the study of iron and steel, as well as a nondestructive testing method of great utility. It will not be possible to utilize this method to the fullest extent until a great deal of research work has been done, both in the collection of fundamental data on the correlation of properties and also in the development of methods and apparatus by means of which magnetic tests on various manufactured articles can be made. The development must necessarily be a gradual one and will require the closest of co-operation between investigators skilled in magnetic measurements and metallographers and testing engineers. It is not to be expected that magnetic analysis will prove to be a "cure all" for all the troubles encountered in the study of steel nor a universal testing method which will displace other existing methods. It is not too much to expect, however, that it will take its place among the recognized methods and that through its use much valuable information will be gained which could not be obtained by any other means.

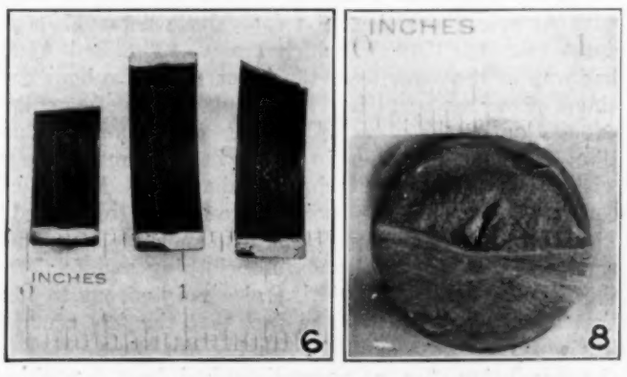


FIG. 6. RESULT OF CRACKS DETECTED BY MAGNETIC ANALYSIS. FIG. 8. AN INTERIOR FLAW DETECTED MAGNETICALLY

Airplane Service in Europe

The airplane service in Europe is not yet on a remunerative basis, according to a recent report from Consul Frank W. Mahin, of Amsterdam. Government subsidies are needed to keep it alive.

The Netherlands government estimates 370,000 florins ($148,740 at the normal exchange rate) as a subsidy, for the year 1922, for the service between Amsterdam and London, which is operated by a Dutch company. England plans to subsidize the English air service from London to Paris, Belgium, and Amsterdam, which seems to mean that a British company will compete with the Dutch between Amsterdam and London. France and Belgium grant varying sums toward payment of pilots, cost of benzine, etc. Germany gives a premium on the number of kilometers flown.

In spite of subsidies, however, it was decided to discontinue the air service between Amsterdam and German cities from Oct. 1 until next spring. The service between Amsterdam and London, and Amsterdam and Paris will, however, be continued without interruption during the winter.

The Deplorable Condition of Russian Industry

Most of the Men in Power Are Without Experience or Technical Education—The Russian Workman Cannot and Will Not Work

By ROYAL R. KEELY

THOSE Americans who have come out of Russia with the statement that the industries and transport are operating with any degree of success are either ignorant or malicious, or both. It appears to me that some of them must have been bribed by the Bolsheviki to bring an optimistic report—either by a direct money bribe or indirectly in the form of profits on contracts awarded. I must say that there is shrewdness displayed in covering up the dirty work, but there is much evidence on close examination which leads one to certain definite conclusions. For the present, just one example to illustrate what I mean:

Since leaving Russia I met a big importer in the Baltic provinces, who began his quoting to the Soviet government by letter but was requested to quote only by phone in order to leave open the opportunity to put in a higher price to the Moscow government. When seed rye was quoted at about $55 per ton privately, the Bolsheviki were paying about $90. But the importer got only the market price and it is easy to guess where the difference went.

Of all the industries of Russia I found just one that had never been nationalized, in other words one of which the owners had not been robbed by the aid of the automatic and the machine gun. Another surprise came to me when I learned that this was one of the best, if not the best, factory in Soviet Russia. The owner was the International Harvester Company of America. The distinctive feature of the factory was that the old manager was left in control and was allowed to manage as best he could under the tremendous difficulty of government control of all labor, fuel, food, clothing, raw material, etc., without means of allotting an adequate supply. In addition, the transport and ways of communication were most deplorably bad. The manager, who was of German education and training, had succeeded in maintaining technical control of the plant, and while his production was infinitesimally low it was not so bad compared with other Russian plants.

Martens Heads the Metal Department

All means of production and ways of communication are controlled from the centralized Moscow office, known in English as the "Supreme Council of National Economy," of which Rikoff is head. Of this, the most important department industrially, and perhaps economically, is the "Metal Department," of which Ludwig Martens is now the head. Martens is (or was) a German subject; he was the official Bolshevik representative in New York, who was deported some months ago by the United States Government. The most competent two men among all the high government officials are Krassin, formerly head of the railway department and now head of the department of foreign trade, and Martens, both said to be of German origin, and to have German tendencies and German sympathies. People who have the interests of Russia at heart are grieved to think that these two, the only ones with technical, executive or business ability to bring anything better into Bolshevism, have degraded themselves by affiliation with this villany. It is said by those who know them that they abandoned their old system of morals and ethics for those of the Bolsheviki.

In June or July of this year, in a conversation with Martens, I was astounded at his admission that they had "discovered that *the Russian workman could not and would not work.*" In the past four years many have been sent to prison for statements of this character. During the last months of my stay, I was surprised at the openness of the criticisms and expressions of discontent among not only workmen, peasants and office clerks, but also among high officials. In a talk with Martens' chief assistant, a fairly able Finnish engineer, his secretary and another able engineer, the latter said, "When you first came to Russia there was still some hope of saving the industries or some remnant of them, but now it is absolutely lost and we must begin over from the beginning." To hear such statements from prisoners, or from open counter-revolutionaries would not be surprising; but from such high officials it sets one thinking, to say the least.

Rising Generation Lacking in Morals and Education

Recently, while walking through the big Amo automobile factory in Moscow, with Martens, I wanted to hear his opinion, so I suggested that the buildings were new and of the finest, and completely equipped with the finest new American machine tools. He replied, "Yes, but dead, absolutely dead." This of course was evident, but still I was pleased to have his opinion. The plant should have had over 6,000 workmen, stores filled with raw materials, work in process and completed product. As it was, there was no material, and only about 1,200 poor, dirty, ragged workers, a considerable portion of whom were working on their new dining room. The mere detail that they had no production and almost no food was a trifling negligible detail to these wonderful Bolshevik managers.

On my arrival in Moscow, Lenin had given me liberty to travel, to see and to understand the production and transport system. In return for this opportunity to get acquainted with labor under Bolshevism, he asked me to tell him when I saw conditions not in accordance with American practice. I wrote him a personal letter dated Dec. 13, 1919, in which I said, "The Red Army has won at the expense of the industries—the bone and sinew of our modern life. The result is almost complete exhaustion of the ways of communication and production. Most of your men in power in the industries are without experience or technical education. It is hard for me to see how it is possible for them to succeed." The reasons were obvious: A painful shortage of trained workmen, raw material and fuel, clothing and food for the workers and transport. I also pointed out to him that equally serious was the fact that the few remaining workmen were spoiled. During the three years of the revolution, the propagandists had been preaching to them that now they were the owners and proprietors and that in the future they were to live in luxury and

idleness as they were told the previous owners had done. This is a serious problem for future Russia. The present generation is so demoralized that there is no hope of its ever doing any satisfactory work. But that is not all, for the educational system has completely broken down under the Bolsheviki. The moral foundation also is destroyed, so that no one in the rising generation is being prepared for the rebuilding of destroyed Russia.

I was then asked to spend some time with Krassin, at that time Commissar, Department of Ways and Communication. I found conditions in the railway shops, locomotive and car shops no better than in the other factories, although a greater effort was being made to keep the railroads running. Krassin saw and understood the situation, yet he continued to support his Bolsheviki. It can only be assumed that he has motives. It gives him power and a good position, and he is in a position to direct the affairs of Russia into German hands. Of one thing I am sure; he is no Bolshevik. He is in the game, like most of the others, for the power and influence which it brings. He is a business man and an executive. Before the revolution he was manager of the big German Sieman-Halske factories in Russia, employing 40,000 men.

By this time I had come to the conclusion that there was nothing in Russia but the destruction of what had been, and I determined to leave. But the gates of Russia open only inward. The Bolsheviki have a dread of letting anyone get out who has any real knowledge of the destruction wrought, the atrocities committed in the name of Socialism or the hopelessness of the situation. I told Lenin that anybody with any education, ability or experience wanted to leave Russia and would at the first opportunity, and that while he might prevent them from going and force them into service, a nation of slaves and prisoners would not make a prosperous or wholesome country.

In Petrograd I found so much of interest that I remained until the last of February, 1920. The factories I found even more dead than in Moscow. The big Tregolnik Rubber Co., with fine buildings and equipment, and employing before the revolution some 38,000 men, was idle. I spent my whole time interviewing former bankers, economists, engineers and factory managers, and in inspecting the important factories, and talking with the factory executives and workmen. What impressed me most strongly was that they were all of the opinion that there was no possible hope of reconstruction or life under Bolshevism.

A Visionary Foreign Trade Department

I was advised to visit the newly organized department of Foreign Trade. Since I had convinced myself that there was no prospect of rebuilding Russia or even of supplying the common necessities at home, I turned with some enthusiasm to the Foreign Trade Department, hoping that I might find there a carefully worked out plan for saving the Russian situation through trade—export and import. I spent almost the whole day with the manager. He outlined to me at considerable length the whole Bolshevik industrial plan. He told me that the spirit of the industrial workers was fine; that they had in their central labor union hall the secretaries of all the various unions (about thirty in all I think) who could be called at a moment's notice on any important question and immediate action secured. He outlined at length their plan for moving the basic heavy industries to the iron and coal fields of the Ural mountains in the west, or the Ukriena in the south. The lighter factories, requiring much highly skilled labor, would remain in Petrograd. And so they had an elaborate plan for the complete rearrangement and rebuilding of the entire manufacturing system of Russia.

When I asked him if he thought Russia could accomplish all this without the aid of foreign capital he said, "No." Then I asked, "How will you enlist this aid?" He replied, "By exports." Then I asked him what they would export. He began with timber and wood, but I asked him, "How is it possible for you to consider exporting wood when your people are living in great distress in houses improperly heated, and your factories are, in many cases, idle because of lack of wood fuel?" (Coal and oil are at present out of the question.)

Then he said they would export flax, but I told him that from my own knowledge there was no appreciable quantity of flax in the country and there was no transport to take it to the ports, and beside, the small quantities which they had would be required for home consumption. Next was gold, but I remarked that while no doubt there was plenty of it in the Ural Mountains, they had no capital, no transport, no organization and no trained workers to produce it. Then he mentioned irrigation in Turkestan, a country that has ideal conditions for cotton. But Turkestan requires irrigation costing millions of dollars, colonization and years of time. He next referred to hides and leather, but I told him the leather industries of Russia could not run because of the shortage of hides. During the long war horses and cattle were destroyed more rapidly than they were reared. The peasants were away in the army and the farming was neglected. Since the revolution the Bolsheviki have systematically robbed the farmers of their stock. If a peasant had more than one cow or horse the Red Guard took away the surplus, either giving to the neighbor who had none, or appropriating for the army or city population. Many hides were lost because of lack of salt and preservatives and improper care. He also referred to grain, but the present hungering proves the absurdity of such a suggestion.

Finally he was forced to admit that I knew the facts and that there was no prospect or hope of help from exports. Then he said that they were accustomed to very little. They would, rather, he said, get along without the modern things and be free from capitalism; they would build from the beginning and very slowly. Then he told me of a plan they had for buying a few locomotives on credit against gold deposits which they would make in foreign banks. They would send the locomotives into the interior of Russia, bring out raw products and sell them for enough to buy other locomotives, and so on. More than a year has passed since that interview and no progress has been made in either production, exports or purchases. In fact there is far less prospect now than then. Some very small purchases have been made, of most necessary things, but only with gold payments in advance. There is no possibility of credit or business except on a strictly cash in advance basis with a government which has no sense of obligation to written contracts.

Early this year I met in prison the head of the timber concessions and export department. I said to him, "Yours is an interesting department, for on the forests Russia can realize more easily and quickly than on any

cther of her natural resources. What is being done in this department?" "Oh," he said, "we have elaborate plans and many inquiries from the outside on timber concessions." He had divided the vast timbered area of Russia into small blocks, one or more of which would be given to each concessionaire, but always with a string attached, i.e., each must build certain permanent improvements, such as waterways, railways, saw mills, pulp mills, etc. But I said, "Just what timber concessions have been actually given?" He reluctantly admitted that at that time none had been given. "But," I said, "you certainly must have exported some timber." He replied, "Yes, we have exported some veneer lumber (thin, three-ply lumber used for making packing cases), but that went to the John McDougal Lumber Co., in England, and applied on an old contract for which payment had already been made.

Plans For an International Hotel

This summer there was a proposed "concession" for an international hotel in Moscow. A great lot of time was spent in perfecting details. The Bolsheviki were to put the hotel in first-class repair and then turn it over to the concessionaires who would have the right to secure their help and provisions from abroad and charge their guests in foreign currency. The plan seemed to have a prospect of success, but the project failed and no concession was given.

I not only saw the industries and transport methods in Moscow, and Petrograd and surrounding districts, but I talked with hundreds of men from all over Russia, including Siberia, so that I got an understanding of the national economic situation. The conditions in Moscow and Petrograd are undoubtedly the best in all Russia, everything considered.

Friction and Carrying Capacity of Ball and Roller Bearings*

Experiments were undertaken by the Bureau of Standards at the suggestion of the Navy Department to determine the maximum safe load and the static friction under load of ball and flexible roller bearings.

Tests were made on balls of 1.00, 1.25 and 1.50 in. diameter in grooved straight races with the ratio of groove and ball radii 1.03 and 1.10; 1.04 and 1.12; 1.04 and 1.12 respectively.

The rollers 1.25 in. in diameter and 5.25 in. long were tested in flat and cylindrical races; the inner cylindrical races having radii 3.5 and 10 in. and those of the outer races 4.75 and 11.25 in. respectively.

The scleroscope hardness of balls and ball races was about 65, that of rollers 70 and of the roller races 97.

Method of Test

Friction Test. Two balls were used in the static friction test to secure stability in the loaded condition. The test was made in a 50,000 lb. Riehle machine; the starting effort was determined with a spring balance. One of the two races was movable and rested on rollers, whose friction was determined separately. No lubricant was used during the test.

Similar tests were made on the rollers, using steel plates. In addition, the cylindrical races were fitted to a 230,000-lb. Emery testing machine. Two rollers diametrically opposite were used being held in position by retainers having the same axis of rotation as the inner race.

The torque necessary to rotate the system was determined by a spring balance acting on a lever attached to the inner race.

Compression Test

Compression Test: To measure the total deformation of a ball (or roller) and two races, an apparatus was designed consisting of a simple lever system. The relative displacement of the longer arms which was proportional to the total deformation of the races and the ball was measured by micrometer microscopes. A deformation of 0.00001 in. could be measured. A similar device was used in determining the deformation of rollers.

To determine the contact area between the race and the ball (or roller) an extremely thin film of lubricating oil was applied to the surface of the race, while the ball was dry. The contact surface was distinctly visible as it appeared darker than the surrounding surface. Its diameters were measured by a micrometer microscope.

Conclusions

Friction Test: (1) The starting friction is nearly the same for both sizes of groove. The groove having the larger radius gave the lowest value.

(2) The ratio of starting friction to load (0.00055) is nearly the same for all three sizes of balls and increases slowly with the load (more rapidly for small size ball) until the "critical" load is reached, when the increase becomes rapid. The critical load varies with the diameter of ball, 1,300 lb. for 1.00-in.; 1,700 lb. for 1.25-in. and 2,200 lb. for 1.50-in. balls.

(3) A similar "critical" load, 25,000 lb. was found for the larger roller bearings with a ratio of friction to load equal to 0.00075.

(4) This "critical" load at which the friction began to increase more rapidly was in all cases lower than the safe load as determined by permanent deformation and calculated from Stribeck's law.

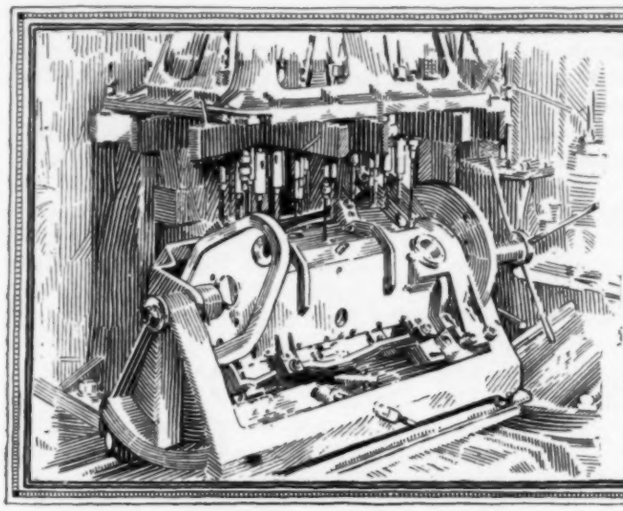
Compression Test: (5) The results of compression tests of balls and rollers agree roughly with the Hertz's theory. The differences are ascribable to inhomogeneity of the material. The total deformation of ball (or roller) and races follows pretty closely the law of a straight line. The smaller diameter of contact area agrees with that given by Hertz's theory, the other diameter differs considerably. This is due to the fact that the major diameter of the arc of contact is not as assumed by the theory, very small in comparison with the diameter of the ball.

(6) The permanent set of a ball is quite negligible even for very high loads (10,000—30,000 lb.) which produce large permanent sets in the races.

(7) The permanent set of the ball races increases very gradually; there is no indication of a load below which no set occurs. With a sufficiently accurate measuring device, the permanent set of races may be discovered at a very low load, below that used in actual practice. The load limit depending upon permanent set of races may be arbitrarily assumed.

(8) A flexible roller does not produce any appreciable permanent set of races unless stressed beyond its proportional limit, which is about 130,000 lb. This limit tends to decrease as the radius of race increases. The breaking load of the rollers was about 190,000 pounds.

*Abstract of Technologic Paper of the Bureau of Standards, No 201, by H. L. Whittemore and S. N. Petrenko.



Tool Engineering

By

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President and Chief Engineer
Dowd Engineering Company, New York City

Special Work-Holding Fixtures for Lathe Use Continued—Closing-in Devices for Outside Holding —Special Faceplate Tooling—Outside-Holding Fixtures for Threaded Work

IN FIG. 260 is shown an example of a piece of work *A* which has been previously machined at *B* and *C*, and must be held for the operation indicated by means of the previously machined surfaces. A special form of closing-in device is used for the purpose. The end of the spindle is furnished with a nosepiece *D*,

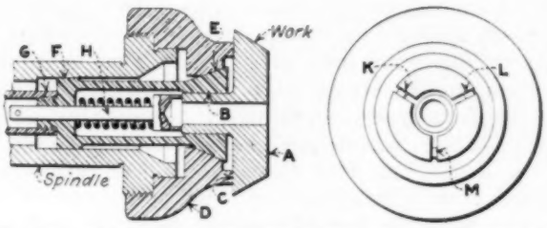

FIG. 260. CLOSING-IN DEVICE FOR OUTSIDE HOLDING

this being made of steel hardened and ground. The work is to be machined on an angular surface and at the end *A* in this operation, so that it is necessary to make the holding device in such a way that it will not interfere with the cutting action of the tools.

A special spring collet *F* is ground to fit the portion *B* and to a taper corresponding with the angular surface *E* in the nosepiece. This collet is split in three places, as shown in the end view at *K*, *L* and *M*. It is operated by means of the lever at the end of the machine through the sleeve *G*, which connects with the collet mechanism. The device is provided with a knock-out *H* which operates automatically by means of the coil spring shown. In setting up this piece of work, a plug is placed in the turret of the machine, and is brought up against the end of the work until it strikes the end of the nosepiece at *C*. The operator holds it there while operating the collet mechanism, after which the turret is indexed and the cutting tools are brought up as needed.

A knockout device such as that shown may be found very convenient for any work which cannot be easily removed from the fixture, and numerous applications of a principle similar to this can be used on various types of fixtures. It is usually necessary when a fixture is equipped with a spring knock-out to use the turret to hold the work in place, so that the spring will not tend to force it out of position while chucking.

In holding a long piece of work having a finished surface of considerable length on which it is necessary to grip it during the holding operation, a somewhat different method may be necessary from those that have been previously shown. An example of this sort is shown in Fig. 261, in which the work *A* is a projectile on which the outside work has been done in a previous setting. The work must be located by the outside finished surface for the operation of boring the inside *B*. Furthermore, the concentricity of the outside and inside is important, so that the closing-in device must be very accurately made.

The fixture *E* is so made that it fits an adapter at the point *F* and is secured to it by means of four screws as shown. An end stop for the projectile is provided by boring out the inside surface *K* to the same form as that of the end of the work. In placing the piece in position in the chuck, it is held back against this seat while tightening the collar *G*. This collar is ground to a taper on the inside, so that it fits the corresponding taper *D* on a spring collet of special form. The other end of this collet at *C* fits a tapered portion in the inside of the holding device. The collet is made of tool steel and split in six places, three from each end, so that it will expand and contract evenly. A special device of this kind is useful when a piece of thin work is to be

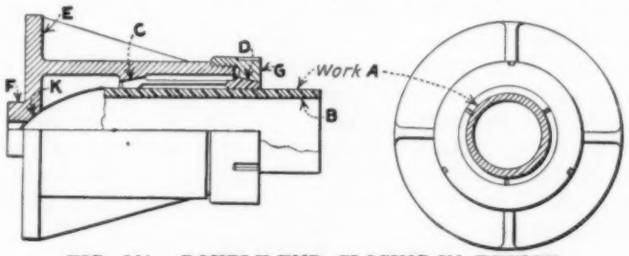

FIG. 261. DOUBLE-END CLOSING-IN DEVICE FOR PROJECTILE

handled, as it does not distort the work, yet it holds it with sufficient pressure to enable the machining work to be done.

We have dealt largely in the previous descriptions with the location of work from surfaces more or less

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concentric with those which are to be machined. The example shown in Fig. 262 is a radical departure from those mentioned in that the work *A* is a drop-forged lever which has been previously bored and reamed at *B*, and which has to be milled on the surfaces *C* and *D*. The fixture shown was designed for the boring, reaming and facing of the large hole. The requirements of the work are that the distance between the hole *B* and the large hole in the hub shall be held closely to size and that they shall be parallel to each other. The fixture *E* is a casting, which is recessed at *G* so that it can be fastened to an adapter, as indicated by the dotted lines. The work is located on a hardended plug having a shoulder at *F*, this end of it being held down by means of a nut and washer as indicated.

The large hub locates on a hardened bushing *H*, which also acts as a pilot bushing for the tools used in generating the hole. In order to locate this end of the work centrally, two swinging arms *L* and *M* are used, being cut away where they come in contact with the work, so as to form a "V." The two members *L* and *M* are so positioned on the fixture that they come above the parting line of the forging and are in contact with a slightly angular surface on the hub, which tends not only to locate the hub but to hold it down slightly

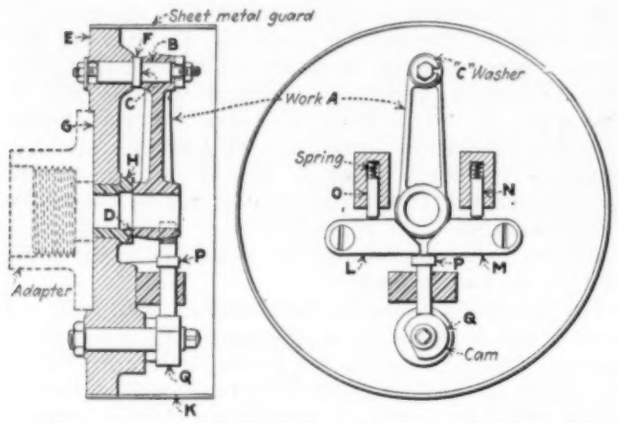


FIG. 262. FACEPLATE FOR SECOND OPERATION ON DROP-FORGED LEVER

against the surface of the bushing *H*. The two arms are operated by means of a plunger *P* which is set up by means of a cam at *Q*. There are two plungers *O* and *N* controlled by coil springs behind them, and these plungers throw the arms *L* and *M* out away from the work when the cam is released.

This fixture is of clean design and there are several good points in its construction. The type of V-block used has been described in a previous article. Due to the fact that protection is required for the outside of the fixture, a sheet-metal guard *K* is applied, so that it surrounds the entire fixture and guards the workman from injury. An additional advantage in this guard is that it prevents the lubricant from flying on the operator, as it might otherwise do if no protection were provided.

Holding a Thin Casting

In Fig. 263 is shown a condition somewhat out of the ordinary. The work *A* is a thin casting which is to be machined in the central tapered hole and on the outside diameter; and also an annular groove is to be cut at the back of the flange as shown by the *f* mark. The work is set up for the operation on three washers *E*, these being so arranged that they will rock on the spherical surfaces *H* so as to equalize any roughness in the casting at the points where they come in contact with it. Similar washers are provided at *F* for the same purpose.

In locating the work, the turret is furnished with a special locating bushing, as indicated at *C*, this bushing being brought up before the bolts are tightened so that it receives the end of the taper hub *B* in the center of the work. The turret is held in place in this position while the bolts are being tightened. A simple type of face plate *D* is used for this fixture. Additional support is given to the work by means of a spring bushing *G* having three points which come in contact with the work opposite to the center hub. This bushing is allowed to spring into place, after which it is held by means of the screw and plug at *J*. This work is a rough casting on which no previous machining work has been done, yet the fixture is so much out of the ordinary that it was thought best to include it here.

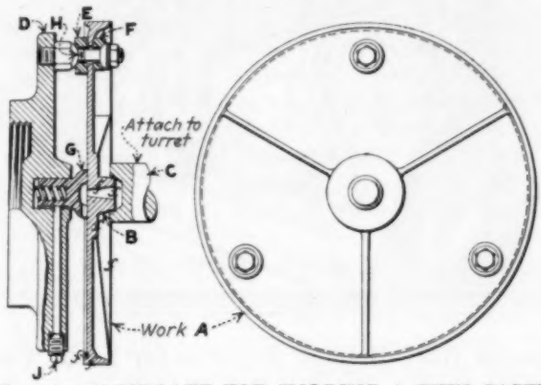


FIG. 263. FACEPLATE FOR HOLDING A THIN CASTING

Work which has been threaded on the outside and on which other operations are to be performed in concentricity with the thread must be carefully held in a special fixture if work is to be done with precision and speed. It may be thought that the only provision necessary for work of this kind would be to screw the piece into a threaded bushing, letting it bear up against a shoulder of some sort, according to the nature of the work. This method might be all right in some cases if

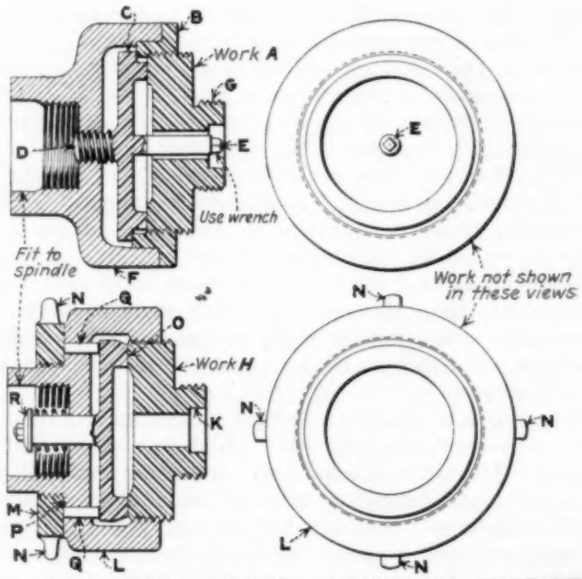


FIG. 264. OUTSIDE-HOLDING DEVICES FOR THREADED WORK

only a few pieces were to be machined, but it should be remembered that the pressure of the cut would naturally tend to tighten the work in the bushing, so that it might be very difficult to remove after the operation. Provision should, therefore, be made against this tendency by designing a special holding device.

An example of this sort is shown in Fig. 264 at *A*. The work shown here has been threaded on the outside of the large end and has been faced on one side and the center hole drilled. The work to be accomplished is the threading of the small hub *G* and facing the end. The threaded portion *G* must be concentric with the large end. A special nosepiece *F* is fitted with a hardened bushing *B*, which is threaded on the inside. The nosepiece is fitted to the end of the spindle. A flanged plug *C* is turned down at *D* and threaded with a left-handed, coarse-pitch thread. The flanged portion of this piece strikes against the inside end of the bushing *B*. When the work is screwed into the bushing it seats against a portion of the flanged member, as indicated. This acts as an end stop for the work. After the machining has been done, a socket wrench is applied to the end at *E* so that the pressure on the work is relieved, thus permitting it to be readily unscrewed.

Another type of chuck for the same piece of work is shown in the same illustration. The work *H* is screwed

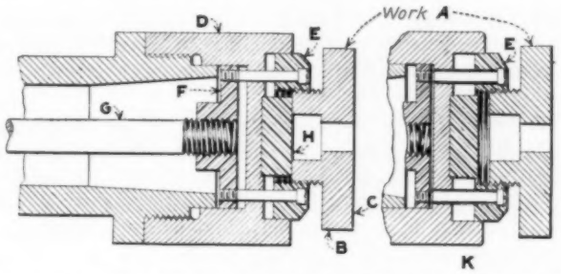


FIG. 265. OUTSIDE-HOLDING DEVICE FOR THREADED FLANGE

into a nosepiece *L*, so that it rests against a flanged member *O*. This member has two pins in it at *Q* extending through to the back of the chuck and bearing against the knock-off ring *M*. When the work is being placed in position, this knock-off ring is screwed up against the back face of the chuck at *P*, thus positioning the locating flange. After the work has been machined, the lugs *N* are struck a sharp blow with a lead hammer, which releases the work and allows it to be unscrewed from the chuck. The flanged member is provided with a stem on the end of which a nut and washer at *R* holds the coil spring in such a position that it keeps pressure against the knock-off member. The member *M* is threaded with a coarse-pitch, left-hand thread, in order to facilitate loosening it and also to make the movement more rapid.

Either of the two designs used in this illustration can be used for work of this kind, but in all probability the latter will be found more adaptable for the general run of work. It is important in any device into which a threaded piece is to be screwed to make sure that the end position of the work is positive.

Outside Holding Device

Another example of an outside holding device for a threaded member is shown in Fig. 265. The work *A* is a flanged member which has been threaded on the hub as shown. It is to be machined on portions *B* and *C* in this operation. A nosepiece *D* is screwed to the end of the spindle and is fitted with a threaded ring *E*. Two screws pass through this ring and enter a disk *F*, into which is screwed a draw rod *G* extending through to the rear end of the spindle and connected to the collet mechanism. When the work is placed in position

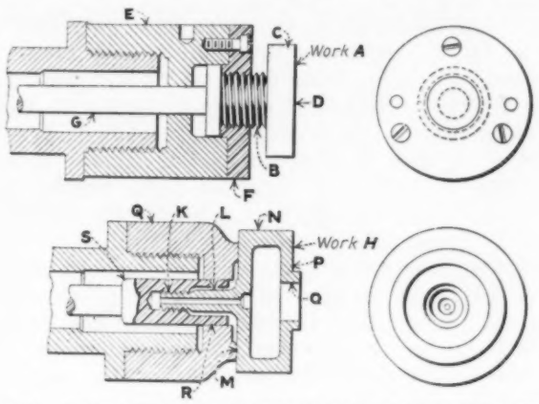


FIG. 266. TWO SPECIAL CHUCKS FOR THREADED WORK

in the bushing *E* it is screwed up against the hardened disk *H*, which gives it the end location. After the work has been done on the piece, a movement of the collet closing lever carries the bushing *E* forward, as indicated at *K*. This action removes all the strains on the work and allows it to be unscrewed very readily. It would be possible to use a device of this sort on a lathe not equipped with collet mechanism, by using a handwheel at the end of the spindle to operate the rod *G*. For small parts which have been threaded, a device of this kind can be used to advantage.

Chucks for Threaded Work

In Fig. 266 are shown two other examples of chucks designed for holding threaded work. The piece shown at *A* has been threaded at *B*, and is to be machined in this operation at *C* and *D*, so that it will be square with the threaded portion. The nosepiece *E* is fitted with a hardened threaded ring *F*, into which the work is screwed until it rests against the end of the plunger *G* that acts as an end stop. This plunger can be operated by a handwheel or by means of the collet mechanism, depending upon conditions. This particular design is so simple that it needs no further description, the working of it being very apparent from the illustration.

A piece of work shown at *H* has been threaded at

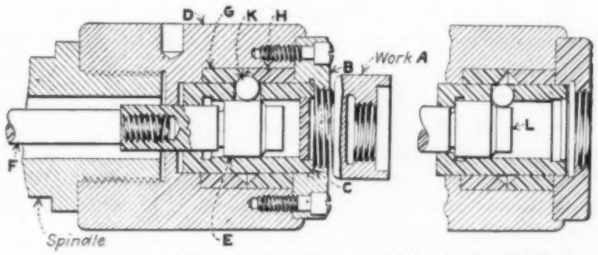


FIG. 267. QUICK-OPERATING THREADED CHUCK

K, turned at *L* and faced at *M* in a previous operation. The outside portion *N*, the hole *O* and the face *P* are all to be machined square and concentric with the threaded portion. The nosepiece *Q* is of hardened steel ground at *R* to fit the sleeve *S*. When the work is placed in position in the chuck, it is screwed into the member *S*.

which is operated by a handwheel at the end of the spindle. Considerable pressure is necessary in order to make sure that the work will not slip when the outside *N* is being turned. The method of releasing the work is obvious.

QUICK-OPERATING THREADED CHUCK

In Fig. 267 is shown a design of a quick-operating chuck for holding threaded work. The piece *A* is screwed in to a hardened threaded ring *B*, and its endwise location determined by its contact with the end of the sleeve *C*. This sleeve is contained in a nosepiece *D* screwed to the end of the spindle, and it is operated by means of the shouldered member *E* attached to the operating rod *F*. The inside of the nosepiece is fitted with two hardened bushings *G* and *H*, chamfered where they come together so that they form an angular internal groove. The sleeve *C* has a hole in it slightly larger than the ball *K*, so that the latter will work freely in it. In operating the device, the rod *F* is pulled back until the shoulder of the member *E* strikes the end of the inside of the bushing *C*, at which time the rod takes the position shown at *L* in the other detail. The ball is constrained to travel toward the center on account of its contact with the angular groove. This releases the whole mechanism and allows the work to be removed easily.

The advantage of an arrangement of this sort is in the positive lock which is provided for the bushing *C*, so that it is not necessary to keep a strain on any of the members. The ball secures the bushing in an accurate and positive manner, giving it at the same time correct end location.

Co-operation in Foreign Trade

BY W. C. ANDERSON

The business of the United States in foreign countries is still approximately 50 per cent greater than it was before the war. Lower prices have much to do with the general apparent depression compared with our foreign trade during the war. Other countries found it necessary then to force their orders upon us and we took the orders and filled them any old way. Confirmed Bankers Letters of Credit were surely worthwhile documents, but most of these attractive assurances of payment stopped when the war stopped. Many of the shipments to foreign ports stopped also.

Those manufacturers who still have a good foreign business are the ones who filled their orders with some degree of conscientiousness. Those who lost their business were the ones who filled the orders with any old thing and raced to the bank with the invoices and bills of lading, cashed in and waited for another victim. The successful American manufacturers are those who worked with an eye to the future and built up a foreign business based upon honest dealing and fair treatment. They were the ones who adjusted claims promptly and gave their customers the consideration to which a good customer is usually entitled.

WHAT CONSTITUTES FOREIGN BUSINESS

Foreign business, now and from now on, is the learning of just what the foreign customers want and complying with their wants. Up to the present time we have had no co-operation in these matters; that is, to any great extent. Our consular service has no appropriations for the purpose of acquiring information relative to the needs of foreign buyers. The United States Consuls in foreign countries have no means of gathering information for the American manufacturers. What is needed by the Department of Domestic and Foreign Trade is a staff of men who know how to go into foreign markets and gather detailed information as to requirements. Sending excursionists and sightseeing delegations under the nom de plume of trade investigators doesn't result in information that is practical to the manufacturer. What the American manufacturer wants to know is what kinds of goods are used and what prices are paid and how he should pack the goods. He wants to know how to meet English and German competition, and above all he wants to know how to overcome the restrictions Great Britain has put upon other nations, including ourselves, in order to make our foreign trade an entanglement of detail. He wants to know why everything he sends out has to be marked "Made in the U. S. A." He wants to know whether he has to put this on goods when no English words appear on the shipment.

If all manufacturers would appeal to their representatives in Washington through their various manufacturers' associations it might be possible to have appropriations made that would enable our consular service abroad to gather the vital detailed information.

If every manufacturer would demand action in the matter it wouldn't be long until all manufacturers would have a good working knowledge of foreign trade requirements—and that is the co-operation which is needed.

Write today to your representative in Washington and ask him to support a movement for appropriations which will enable our consular service abroad to gather foreign trade information.

Make your appeal through your "Manufacturers' Associations" and build upon a substantial foreign trade foundation.

Are Hollows Worn in Hammer Handles?

BY R. G. MCDOWELL

In the columns of the *American Machinist* of recent issues, numerous articles have appeared under the above title. For the information of the younger machinists the writer can say that he has known for forty years

SHOWING WEAR ON A MILD STEEL LEVER-HANDLE

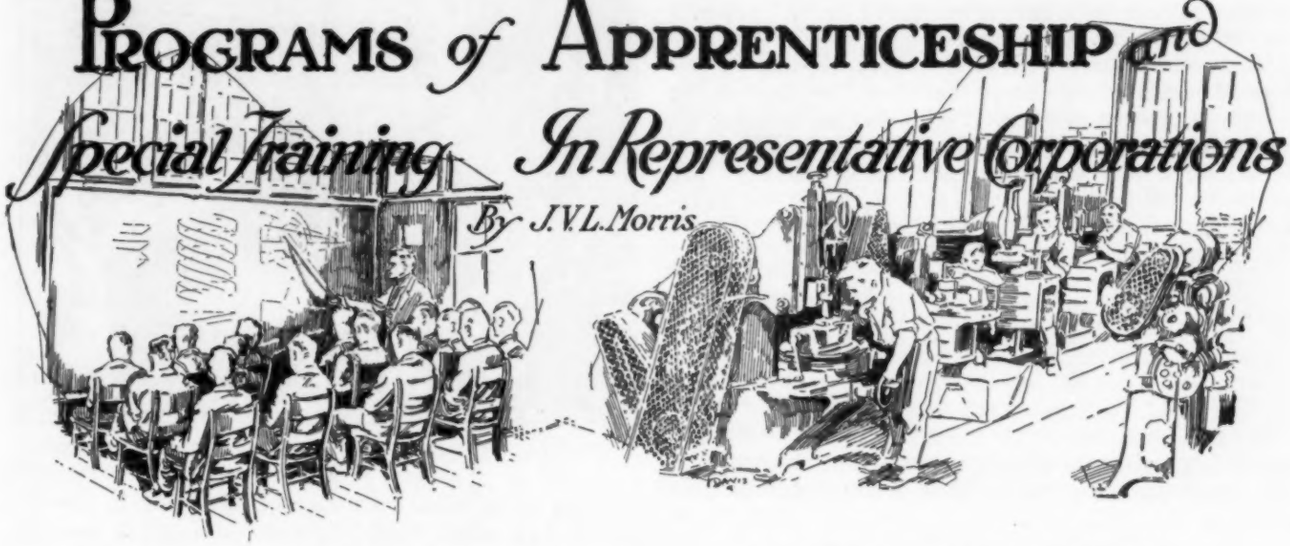
that hollows are worn in hammer handles. When I was an apprentice I used the same hammers that my father had used and the handles were worn when I got them.

The handles of hammers used by diamond setters in setting diamonds in rock drills are generally worn though used with dry, clean hands.

The other day I noticed that the handles on some of the levers used in mine operation were badly worn. The levers are of mild steel, and are shifted about one thousand times in twenty-four hours. The accompanying sketch shows in full lines the original shape of the handles, and the dotted lines indicate the average shape to which they have been worn in 23 years of service.

Programs of Apprenticeship and Special Training In Representative Corporations

By J. V. L. Morris



XVI. The Watervliet Arsenal, Watervliet, N. Y.

Separate Department for Apprentice Training—Evening Classes for Improvement and Trade Extension —Training of Foremen—Well-Rounded Plan of Employee Instruction

THE Watervliet Arsenal has long been maintained by the Ordnance Department of the United States Army. For ten or twelve years apprentices have been employed, but, owing to the relatively small number of employees previous to the late war, not more than ten or twelve were taken on each year. As a result, however, of the increased production stimulated by the war and an awakened interest in apprenticeship there were at the time this survey was made seventy-six apprentices, all being in the machinist's trade. In this connection it should be noted that there were 475 all-around machinists and toolmakers employed in the arsenal, and about the same number of operatives and skilled specialists.

The plan of organization for training is of interest. In general charge of all educational activities in the works is a superintendent of education. These activities embrace apprenticeship, intensive study, visual instruction, mass education, a vestibule school, and foreman training.

Apprentice Training

In charge of apprenticeship under the direction of the superintendent already mentioned is a supervisor, who is a machinist of long experience and apprentice trained, who previous to the expansion of the apprentice department gave all the supplementary instruction. He is now assisted by an instructor in shop mathematics and applied science, formerly an assistant professor in Rennsalaer Polytechnic Institute, who is devoting all his time to this instruction; and for the work in drawing by a professor of design from the same institution who is employed on a part-time basis.

The first year of apprenticeship is spent in the training department, which is a separate and distinct section of the plant with a generous equipment of all the standard types of machine tools and with facilities for twenty-five boys. A view in this department is shown in Fig. 66. In charge of this section is the supervisor, who is assisted by two experienced mechanics to act as subforemen in training at regular production jobs. For the remainder of the term of apprenticeship the boys are transferred for further experience about the plant but always under the friendly direction of the supervisor. A boy at work on a job in the plant can be seen in Fig. 67.

Supplementary instruction is provided for six hours a week, so arranged as to be about equally divided between the employer's and the apprentice's own time. This is accomplished by requiring them to work until six o'clock instead of five on the two days a week in which they receive their instruction. The adherence of the apprentices to this arrangement is secured by their signing a special agreement upon indenture to put in one hour of study on mathematics and drawing for each hour of instruction given in place of work during regular employment hours. In Fig. 68 can be seen a class in mechanical drawing.

The instruction is divided into six terms of twenty-one weeks each, as follows:

Term I.	Arithmetic	2 periods of 1½ hours each per week
	Algebra	2 periods of ½ hours each per week
	English	2 periods of ½ hour each per week
	Practical Talks	2 periods of ½ hour each per week
Term II.	Arithmetic	2 periods of 1½ hours each per week
	Algebra	2 periods of ½ hour each per week
	English	1 period of ½ hour each per week
	Practical Talks	1 period of ½ hour each per week
	Mechanical Drawing	1 period of 1 hour each per week
Term III.	Mechanical Drawing	2 periods of 1½ hours each per week
	Mensuration and Geometry	2 periods of 1½ hours each per week
	Practical Talks	1 period of ½ hour each per week
	Industrial History	1 period of ½ hour each per week
Term IV.	Trigonometry	2 periods of 1½ hours each per week
	Mechanism	1 period of 1 hour each per week
	Mechanical Drawing	2 periods of 1½ hours each per week
Term V.	Tool Design	2 periods of 1½ hours each per week
	Strength of Materials	2 periods of 1 hour each per week
	Mechanics	1 period of 1 hour each per week
	Practical Talks	1 period of ½ hour each per week
Term VI.	Tool Design	2 periods of 1½ hours each per week
	Practical Science	2 periods of 1 hour each per week
	Mechanics	1 period of 1 hour each per week
	Shop Economics	1 period of ½ hour each per week

Boys fifteen to eighteen years of age are eligible for apprenticeship, those with at least one year of high school being preferred. The candidates must pass a civil service examination which is given twice a year, and from the eligible list thus established selections

are made at such times as needed. In an endeavor to assure that the boys thus selected will be "A" grade, a weight chart, Fig. 69, is used.

The remunerative returns for apprenticeship in this arsenal seem more generous than would be possible for a private concern to offer. The indenture calls for six whole terms of 1,250 hours each, which works out as about three and one-half years, since the boys are granted a thirty-day vacation each year and the working week is forty-four hours in length. Upon this basis the apprentice pay is as follows:

1st period	25c. an hour or $11.00 a week
2nd period	27c. an hour or $11.88 a week
3rd period	30c. an hour or $13.20 a week
4th period	32c. an hour or $14.08 a week
5th period	35c. an hour or $15.40 a week
6th period	40c. an hour or $17.60 a week

In addition to this, after the first six months $20 per month bonus is paid by the government, which brings the apprentice's pay up to what seems generous proportions.

Evening Improvement and Trade Extension Classes

"Intensive study" is the caption under which evening classes were during the past winter organized in the plant. Merely the fact that a night school is provided is, of course, of no great significance beyond the plant;

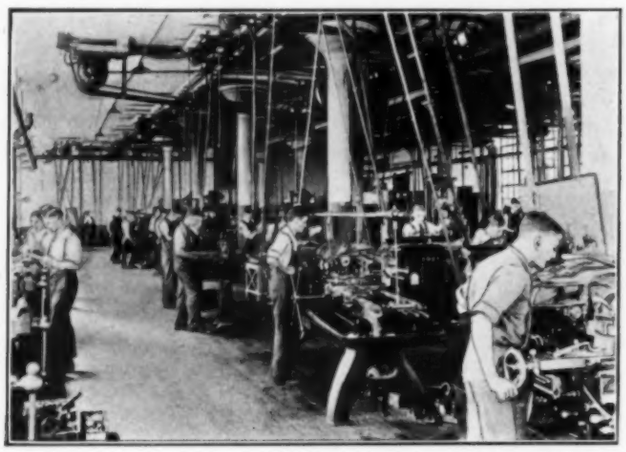


FIG. 66. VIEW IN APPRENTICE-TRAINING SHOP

but that the classes were planned and promoted by a committee of employees does seem of some importance as suggesting an essential form of procedure to insure their success. The year was divided into two terms of twenty weeks each, with two lessons a week. The cost of registration was placed at $5 per term for adults and $2.50 for employees under twenty years of age. There was said to be an average enrollment of eighty-four altogether in the following eight courses:

English and Current Events
Elemenetary Mathematics
Advanced Mathematics
Strength of Materials
Drafting
Elementary Electricity
Commercial Arithmetic, Cost Keeping and Stock Keeping
Penmanship, Stenography, and Typewriting.

Some of the classes were held from 5 to 6 p.m., while others were from 7:30 to 9 p.m., so as to be at times most convenient to the students.

"Visual Instruction" seems to be merely a title under which "industrial and entertaining movies" are being provided. It is not believed that much was expected

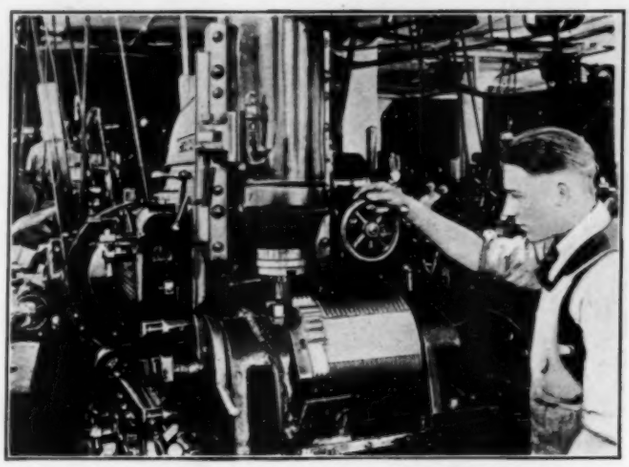


FIG. 67. APPRENTICE MILLING A BREECH BLOCK IN THE PLANT

of them as an effective means of education in the industry, but rather that they were intended to provide innocent diversion which might not otherwise be available. Such a provision is, of course, to be recommended, more especially in industries located at points not readily accessible and where the plant seems the natural center for such activities.

The employee's committee on "Mass Education" has provided a series of noon-hour lectures twice a week. The lecturers seem to be in the main nearby clergymen and educators. The idea actuating the movement is evidently to enlist inspirationally the best efforts of the working force toward co-operation in production and enlightened community activity. How effective this movement will be undoubtedly depends on its permanency and its effectiveness in reaching the bulk of the workers. If the lectures are patronized only by those habituated to church, Young Men's Christian Associations and lecture forum it is reasonable to assume that the movement will not function beyond the circles already reached by those community agencies.

Vestibule School

In the "Vestibule School" it was stated that there were now three ex-service men being given training for rehabilitation. Their first period of training is for six months and if they are not proficient at the end of that time they are to be given one or even two more similar periods of training.

A "Foreman's School" is also maintained, meeting

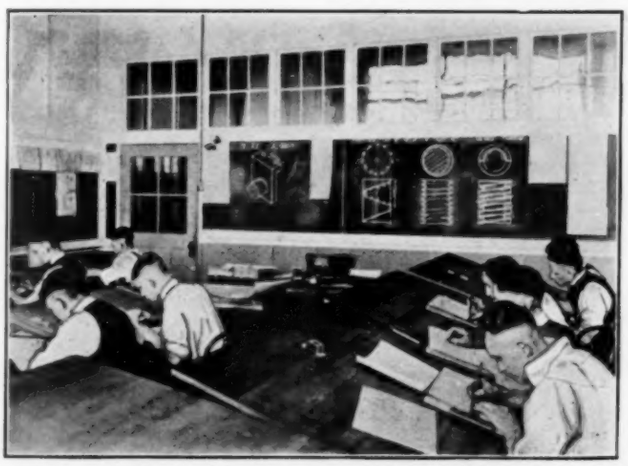


FIG. 68. APPRENTICES IN MECHANICAL DRAWING CLASS

fortnightly in lunch sessions in the plant's cafeteria. This effort toward improvement of the working force at a vital point seems to be favorably considered and to be developing toward more intensive utilization.

"Apprenticeship," "Intensive Study," i.e., night school trade extension as a co-operative movement of employees and management, and foreman training all seem measures favorably received and developing as

	Weight		
Mental			
(a) Education not less than 8th grade at 16	5	( )	
(b) Observation	5	( )	
(c) General knowledge	5	( )	
(d) Attitude	5	( )	
(e) Self-reliance	5	( )	
Total	25		( )
Moral			
(a) Manners and habits	5	( )	
(b) Character	10	( )	
Total	15		( )
Physical			
(a) Appearances	5	( )	
(b) Activity	5	( )	
(c) Health	10	( )	
Total	20		( )
General Impression			
(a) Tact	5	( )	
(b) Common sense	10	( )	
(c) Mechanical aptitude	5	( )	
(d) Future ambitions	5	( )	
Total	25		( )
Mathematics	10	( )	
Reference	5	( )	
Total	15		( )
Grand Total	100%		( )

Applicant ..... Date .....
Course ..... Interviewer .....
Accepted ..... 1 Comm. check .....
Reported ..... 2 Comm. check .....
3 Comm. check .....
Agreement signed .....

FIG. 69. WEIGHT CHART FOR SELECTION OF APPRENTICES

useful expedients toward improving the plant's working force. Particularly to be commended seems the apprentice system, where the equipment of the training department, the quality of the teaching staff, and the plans for related-work instruction with that for systematic training in practice, all seem eminently satisfactory. This condition is reflected in the apparent high quality of the young men undergoing apprenticeship, and their satisfaction expressed to the writer as to the conditions.

Cut the Force or Reduce Working Hours?

BY S. N. BACON

On page 375 of the *American Machinist*, A. W. Forbes, in discussing the unemployment situation, inquires why the unemployed do not apply for work. In his discussion he makes the surprising statement that he has actually received less applications than a year ago. It is evident to the writer, who is a mechanical engineer and shop foreman, that Mr. Forbes is not familiar with the situation in various cities and in a variety of manufacturing plants.

There is a very good reason why there are not more applications made, at least at the large plants, and that is the almost universal practice of hanging out a sign "No Help Wanted" which confronts laborers, skilled help, engineer draftsmen and office employees alike. It is almost useless to apply at a small shop unless it advertises, because one is very apt to be interviewed by a clerk in the office.

In regard to filling out applications, the skilled workman has learned through experience that it is a waste of time because they are invariably filed away and become stale after a few weeks or months have passed and the employer feels that the applicant has either secured a position or left for parts unknown, so he inserts an advertisement and receives a large number of fresh applicants, perhaps a few of whom are already employed.

It seems to the writer that it would be far better to have a system whereby the applicant could qualify for a position which is sure to open up in the near future, and in the meantime keep in touch with the would-be employer by means of return mailing cards which the former would receive periodically.

Referring to the second paragraph in the above mentioned article, if the men who were let go were not good enough for future prosperity, then they should have been dispensed with before the lean years came on; which proves to a certain extent that with a well-balanced organization of good workmen the best and fairest policy is to cut the force.

Metallurgy in India

BY L. BECKER

Chief, Iron and Steel Division, Department of Commerce

India, during the next five years, will witness considerable development and growth in its metallurgical industries, particularly those of iron and steel, in the opinion of S. M. Marshall, consulting engineer for the Tata Iron and Steel Co., who has recently made a study and survey of railway traffic as relating to these industries. Plans have been drawn up for extensions to existing mills and new plant construction, all for completion and operation during this period.

At the present time there are only three industries of this kind in operation: The Bengal Iron Co., at Kulti on the East Indian Railway, the Tata Iron and Steel Co., at Tatanagar on the Bengal-Nagpur Railway, and the Cape Copper Co., at Rakha Mines on the same railway. There are, however, three large new plants under construction or in serious contemplation. These are the Indian Iron and Steel Co. near Asansol, the Eastern Iron Co., whose plant will probably be located near Chandil on the Bengal-Nagpur line from Sini to Adra, and a third company whose plant will probably be at Manharpur on the same railway.

In addition to these, the three existing plants have extensions under way or planned. Furthermore, a number of similar industries are locating near the works of the Tata Iron and Steel Co. At the present time eight of these subsidiaries are proceeding with their construction, and several others are under immediate contemplation.

The iron ore and coal come from the same districts for all the iron and steel companies. The two main coal fields are located east and west of the Bengal-Nagpur line to Asansol. The iron ores are located in Manbhum, Singhbhum, Keonjhar, and Bonai States and lie immediately south of the main line for a distance of about 100 miles from Tatanagar to beyond Manharpore. The flux for the companies comes largely from points on the same railway west of Manharpore, although a small quantity is secured on the East Indian Railway near the Sono River.

The Indian Iron and Steel Co.'s plant will be ready for operation in a year, and the extensions of the Tata Iron and Steel Co. will start progressively within the next two years.

Transfer Dies for a Shallow Cup

The Construction of a Combination Die—How a Transfer Mechanism Is Designed—Blanking, Piercing, Forming, and Swaging, in One Operation

BY FRANK A. STANLEY

THE accompanying line drawings illustrate a set of compound dies for blanking, piercing and forming a shallow cup and for swaging the cup to the form shown in Fig. 1. The blank is shown at the right in the drawing; the shape to which it is drawn or formed at the same stroke as the blank is cut is shown at the center, and the tapered form as swaged is seen at the left. Combined with the compound construction of the dies is an auxiliary device which automatically transfers the straight drawn cup from the drawing die to a swaging die in front, so that after the first stroke of the press, each down movement produces a plain cup and at the same time completes the swaging of the preceding cup, each stroke thus discharging a completed piece from the press.

The blank is punched out 0.691 in. in diameter in the compound die and the continued downward stroke of the press pierces the $\frac{1}{8}$-in. hole at the center and forms the cup to a depth of $\frac{1}{8}$ in. The transfer then carries the piece to the swaging die at the front where the cup is tapered and the open end made 0.005 in. smaller than the bottom of the cup. The dimensions of the swaged cup will be seen at the left in Fig. 1.

The press tools as assembled are illustrated in Fig. 2, the die base being shown at *A* and the punch head at *B*. Both are of cast iron and both are bored for two $\frac{3}{4}$-in. guide pins or pillars.

The blanking die is shown at *C*, Fig. 2. This die is a piece of tool steel finished to rectangular form, 3 in. long by $1\frac{3}{8}$ in. wide, and $\frac{7}{16}$ in. thick. The die opening is 0.692 in. in diameter. It is secured by fillister head screws and dowels to the die block. It is also drilled and tapped for screws and dowels for carrying the stock guide and stock stripper *D*. This plate has a guide channel for $\frac{3}{16}$-in. stock, the thickness of the stock being 0.020 inch.

The blanking die *C* is counterbored at the underside to fit over the projecting end of tool steel member *E*, which is pressed into the die base and is drilled at four points longitudinally to receive the four shedder pins *F*, which are of 0.187-in. drill rod hardened. These pins are $1\frac{7}{16}$ in. long. They act upon the underside of shedder *G*, and are themselves acted upon by the rubber pad *H* underneath the die base. The combined blanking punch and drawing die *I*, in descending, blanks out the disk, 0.691 in. in diameter, and continuing downward forces the work and member *G*, which acts as a pressure pad, down into the die against the pressure of rubber spring and shedder pins *F*. At the same time the blank is drawn into a shell inside the drawing die *I* and on the drawing punch *J*, the latter fitting nicely inside of drawing ring or pad *G*. The same action causes the shell to be pierced by piercing punch *K* carried inside of drawing die *I*.

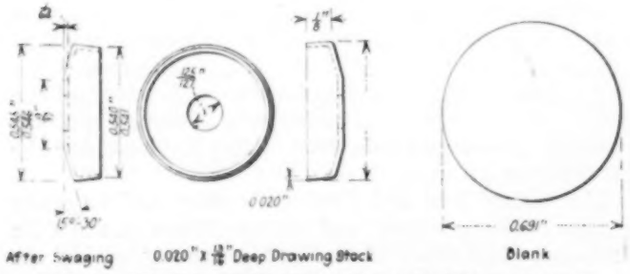


FIG. 1. FINGER KEY CUP AT DIFFERENT STAGES IN PROCESS OF MAKING

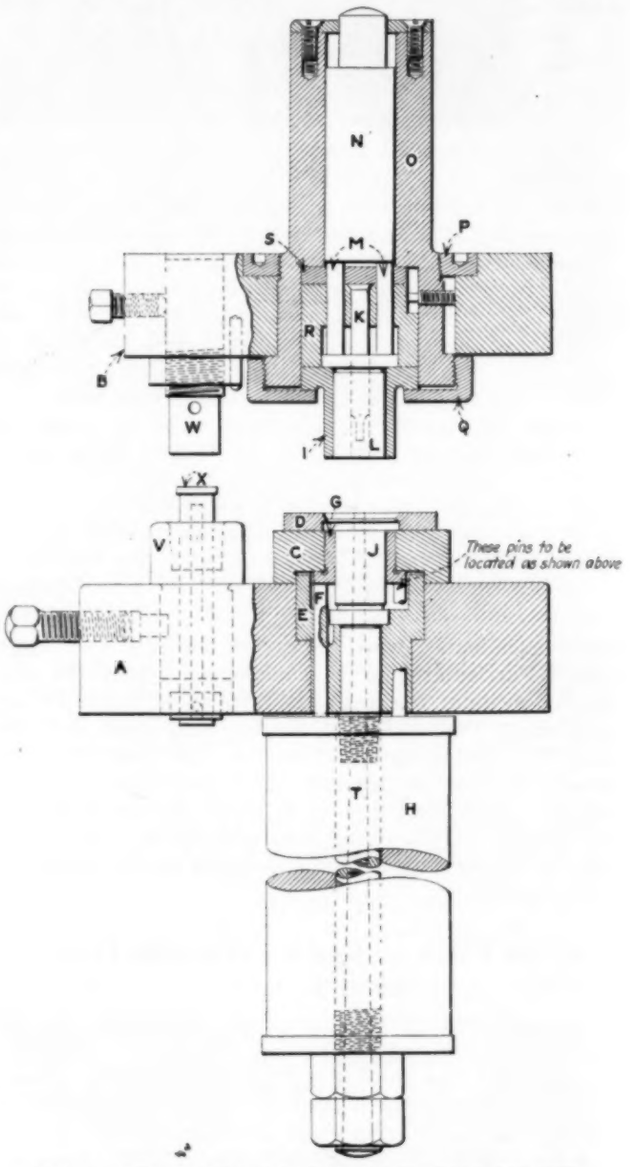


FIG. 2. SECTIONAL VIEW OF COMBINATION DIE ASSEMBLY

On the up stroke, ring *G*, forced upward by pressure pins *F*, strips the work from the punch *J*, and ejector *L*, acted upon by knock-out pins *M* and plunger *N*, ejects the cup from the drawing die inside of blanking punch *I*.

The blanking punch *I*, which also contains the drawing die, is provided with a collar or head which fits inside tool steel shank *O*. This shank is threaded to receive a locking nut *P* at the back, and its lower end

is also threaded for ring nut *Q*. The shank fits snugly in a hole bored in the punch head casting and is fastened in place between its shoulder at the bottom and ring nut *P* at the top. It is also keyed in place. Nut *Q* when screwed on secures punch and die *I* firmly against the bottom end of knock-out carrier *R*. Piercing punch *K* fits nicely in *L* and *R* and its enlarged head abuts against a steel plate *S* at the top of the recessed chamber in the lower end of the punch holder shank *O*.

Drawing punch *J* is shouldered, and this shoulder rests upon a seat formed in the center of *E*. A hole is formed in this to serve as a piercing die. The lower end of part *J* is threaded to fit a tapped hole in the upper end of stud *T*, which carries at its lower end nuts for holding and compressing the rubber spring *H*, which is confined between two steel washers at the top and bottom of the stud.

Referring now to the transfer feature of these dies, Fig. 3, when the punch rises and the upper knock-out comes into action, it forces the cupped work into the transfer chuck *U*. When the press is at the top of its stroke, the transfer chuck stands in central position, where it receives the work. When the press ram starts to descend, the transfer chuck and arm *U* also descend and at the same time they swing forward to carry the work over the swaging die at the front of the die block proper.

Punch *W* (Fig. 2) then forces the work into die *V* and the tapered swaging effect is produced on the shell.

On the up stroke, the swaged cup is ejected from die *V* by the knock out *X*, and the transfer arm *U* returns to central position as shown in Fig. 3.

This transfer member *U* is pivoted on a vertical post *Y* which is one of a pair of studs passing down through the die base and through a strap *Z* which is secured to the bottom of studs *Y* by nuts as indicated. The upper ends of studs *Y* are passed through punch holder *B* and secured by nuts at the top. The pair of rods *Y* thus act in conjunction with strap *Z* as a positive knock out, so that as they ascend on the up stroke of the press, they cause knock out *X* to rise and eject the work from the swaging die *V*.

Referring again to the method of pivoting the transfer chuck and arm *U* on post or stud *Y*, it will be noted in Fig. 3 that the part *U* is mounted on the stud so as to rest against the shoulder *M*, and while free to swing about on this stud, it is held from independent up and down movement and must travel up and down with the stud through the controlling action of a hooked member *BB*. This member is threaded at the end and passes through the die base, the upper end then projecting over the hub of arm *U* so that it confines the top of that member by the action of spring *CC* at the under side of the die base. Now as the punch head descends, the spring *CC* draws down the transfer member *U*, and upon the up stroke the punch head causes stud *Y* to lift the transfer member positively to normal position.

The downward movement of transfer arm *U* is accompanied by a swinging movement to carry the work forward over swaging die *V* through the medium of a cam slot in plate *DD*. The slot as there represented is $\frac{5}{8}$ in. wide and receives a cam roll *EE* which is mounted upon a reduced bearing provided at the outer end of

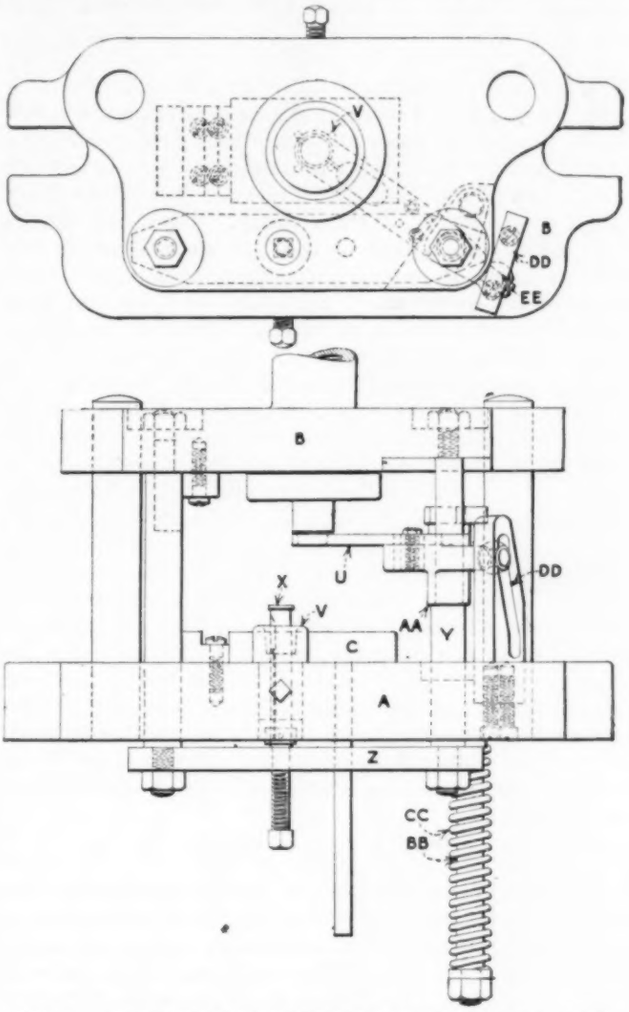


FIG. 3. VIEW SHOWING DETAILS OF TRANSFER ARM

transfer arm *U*. Here the cam roll is retained in place by means of a small fillister headscrew.

It is evident that with the punch and die in the position shown in Fig. 3, when the punch starts to descend, the action of the cam slot *DD* is to throw the rear end of the transfer arm around toward the back and thus cause the front end with the work to swing forward over the swaging die. As it reaches a central position over that die, the punch *W* forces the cup out of the transfer chuck and down into the die. The up stroke carries the transfer back to its starting point ready to receive another piece of work and the knock out below ejects the swaged piece from the swaging die *V*.

These tools were made at the shops of the Smith Premier Typewriter Company, Syracuse, N. Y.

The End of British Preference in India

British Engineering Firms Not to Receive Preferential Treatment—German Artificial Prices Condemned—A Market for American Machinery

By F. C. CHAPPELL

READERS of this journal may not be aware that the British government has granted a very full measure of fiscal autonomy to India. There has been a persistent demand of late years among almost every class of educated East Indians for a larger share in the management of the country. The great assistance which India gave to the British Empire during the late war has been acknowledged by a very liberal grant of self-government, including, as I say, the control of import and export duties. When we remember that India is an enormous buyer of machinery and engineering manufactures of all kinds from Europe, and to some extent from U. S. A., we should at once see the importance of a measure that puts Britain on exactly the same plane as other nations in the competition for orders. To all intents and purposes British exporters of iron and steel goods, especially railroad plants of all kinds, have received a preference over their competitors, but all this is now abolished. The immediate effect of this is seen in a resolution just passed by the Indian Legislative Assembly recommending that all stores be purchased in the cheapest market, consistent with the requisite quality being obtained. It has frequently been alleged that the East Indian Railroad Corporation, run by the Indian government, gave preference to English contractors, although material and equipment might be bought cheaper and equally well in the United States or in Germany.

Favors Shown British

The position of British and foreign purchasers was recently very clearly explained by the director-general of stores to a committee of inquiry which has lately been sitting. He said: "I have a great deal of pressure put on me at various times in England to deal with British firms. They say it is very hard that they should be penalized by the abnormal advantages obtained by Germany through the exchange," etc. The principle he has followed is that if the lowest British tender is within 10 per cent, say of the German or Belgian tender, the contract goes to the British firm. Another point is that the British firm may be able to turn out the goods in much quicker time; while another consideration is that of the much higher cost of the work of skilled inspection to insure adhesion to the standards laid down when contracts are executed abroad. The director-general told the committee that on occasions if the lowest German tender is considerably lower than the lowest British tender, he has communicated confidentially the terms of the German tender to the British, and asked him if he will come down. "Sometimes he comes down to an extent that justifies one in giving the business to him; sometimes he does not. The following are some recent examples: Wheels and axles, German price, £45; British price, £83 15s., subsequently reduced to £67. Rails, foreign price, £10 10s.; British price, £17, subsequently reduced to £11 10s. In the former case the reduction was insufficient; it is understood that in the latter case the revised British tender was accepted." The director states that he would not adopt such a system under normal conditions. "The Germans," he said, "are simply putting up an artificial price; and we don't want to see British firms ruined by such prices." The result would probably mean a German monopoly, and he adopted a moderate amount of preference for British firms to last while the present abnormal conditions exist.

To give you an idea of the value of this trade I may say that the value of stores purchased by the state-owned Indian railroads for the ten years prior to 1919 was 486 lakhs of rupees, while the purchase of private-owned companies was double that of the state-owned corporation. The Indian government has just raised a loan in London for seven and one-half millions to be spent on the purchase of railroad materials for the state lines alone, and a good deal of this will be supplied by British firms, while seven more millions will also be spent this year on the same objects.

British Monopoly Gone

But India has ceased to be a monopoly or close preserve for the benefit of the English manufacturer. It will be many years before all the parts of a locomotive can be made in Indian machine shops and until that time comes India must continue to be a splendid market for European and North American machinery exporters. The railroads have fallen into a deplorable condition and it will need the expenditure of vast sums to bring existing lines up-to-date. As I stated there is to be an immediate outlay of seven and one-half millions and United States firms may expect notices of tender before long. Several new lines are also under consideration and will be proceeded with as soon as circumstances permit.

In view of the growth of protectionist feeling in India, British manufacturers are establishing themselves in the country. United States makers of machine tools should find India a really excellent market and one that will last for many years to come. In addition to this there is a ready sale for simple soap-boiling plants, including pan, boilers and vacuum glycerine apparatus. Makers of machines for milling rice and wheat would do well to investigate the market. Ice making and refrigerating machines are badly needed. It is certainly worth noting that special attention is being given in the United Provinces to fruit preserving, pulping and canning, as well as jam making. Cream separators are also being employed in the manufacture of ghee and sales can be increased. In the United Provinces there is also an opening for furnaces and bottle blowing machines for the glassware trade.

The market has been kept short of electrical machinery and supplies since the war, but these will be in increased demand as soon as manufacturers can ship the same. The share of the United States in the electrical trade of India has doubled since 1914. British makers take the view that United States exporters will not be able to increase their hold on this market for electrical goods. Japan is making much headway with fittings and accessories.

The Indian government is anxious to foster industry and especially wants the community to utilize within

the country itself all products of the sort to a greater extent than in the past. There is bound to be a demand for every item of cotton mill equipment including renewals for jute spinning and weaving machinery. The government has sanctioned extensive schemes in connection with the further exploitation of state collieries. This will involve the purchase of various plants and general engineering material. The use of coal mining machinery is largely extending in India. Tea garden machinery is also wanted as little machinery of this kind has been imported lately. Saw mills and portable timber felling machines are needed; also a plant for paper pulp manufacture, match-making machines, and a plant for the production of tanning extract. An increasing market exists for crosscut saws, axes and adzes.

There are excellent possibilities for the sale, in connection with the existing installations, of motors, cable and wire, fans, lamps and other apparatus.

Kinks From Far-Western Railroad Shops

SPECIAL CORRESPONDENCE

Although much of the work in railroad shops in various parts of the country is very similar, it often happens that different methods are devised for handling the same kind of a job. The interesting device shown in Fig. 1, is from the Hillyard shops of the Great Northern Railway, just outside of Spokane, Washington, and is for setting the valve motion crank, often known as the half-crank, used on locomotives having a Walschaert valve gear.

Instead of waiting until the wheels are under the locomotive and the valve mechanism is in place before setting these cranks, general foreman A. B. Colville made the device shown. It consists of a light but rigid tripod with the legs suitably placed and a main central tube which carries a center that fits into the center of the locomotive axle. On the outer end of the central tube *A* is an arm *B*, carrying a pointer *C*. The rod *B* is graduated so as to allow the pointer *C* to be easily set.

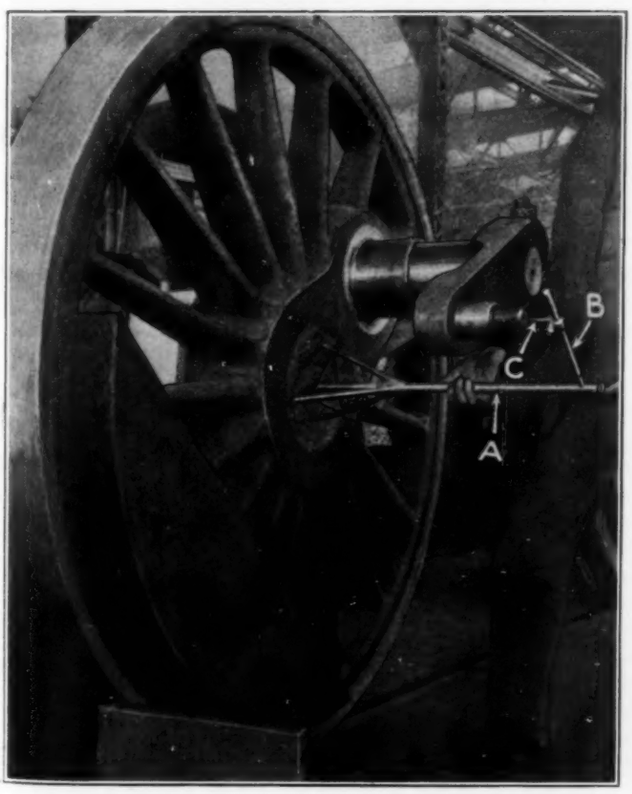


FIG. 1. SETTING WALSCHAERT VALVE CRANKS

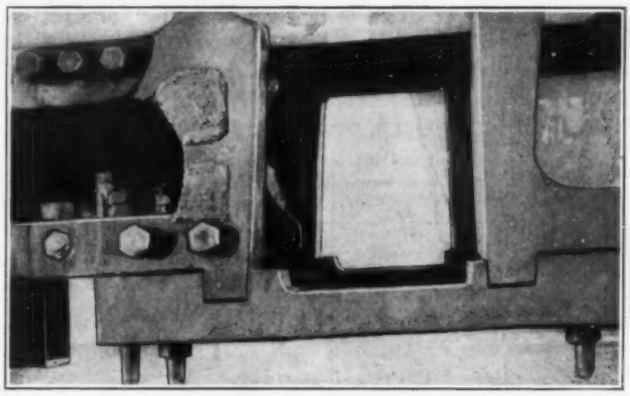


FIG. 2. A WELDED FRAME

FIG. 3. UTILIZING OLD FIREBOXES

Each kind of locomotive has a different setting and a small blueprint table shows the proper distance between the central tube *A* and the pointer *C*. Setting the pointer to the proper position, it is only necessary to place the tripod in position and swing the half crank until its center coincides with the pointer *C*. This enables the crank to be quickly set and removes the necessity for any further adjustments after the wheels are placed in position on the locomotive.

A good example of frame welding is shown in Fig. 2, which also comes from the Great Northern shop at Hillyard. Two rather bad cracks developed beside the pedestal jaws and were welded by oxy-acetylene as shown, without removing the frame from the locomotive.

THE DENVER & RIO GRANDE

Fig. 3 shows how the Denver & Rio Grande shop at Salt Lake City utilizes old fireboxes for handling turnings and other waste material. With the lower part of the side sheets cut off and suitable hooks or eyes riveted into place, they make substantial and convenient holders that can be readily handled by the crane.

A device in the shop of the Denver & Rio Grande at Burnham, which is really a part of Denver, Colorado, is for turning grinding wheels used in sharpening the formed tool for finishing tire flanges. The truing device consists of a stand carrying a series of levers on the top which control the path of the diamond tool used for truing. These levers are so proportioned and arranged that they outline the correct shape of the wheel. This arrangement was devised by H. G. Strong, general foreman of the shop.

This shop is also putting in grooved piston rings as

shown in Fig. 4. The drawing shows a cross section of the ring which is grooved for approximately half its depth and has $\frac{1}{32}$-in. holes drilled through at about every 6 in. of the circumference. Two or three rings are used to each piston, enough being cut out to allow the ends

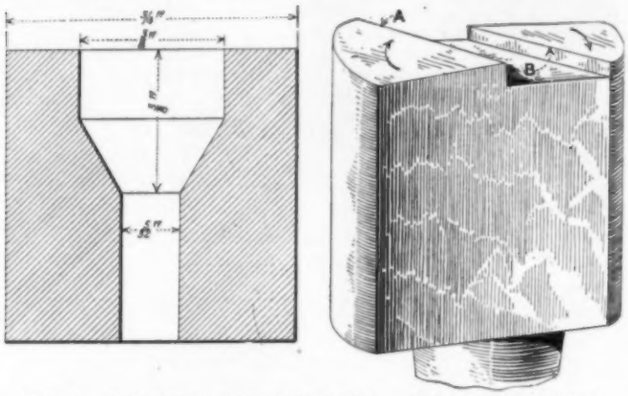


FIG. 4. GROOVED PISTON RINGS. FIG. 5. A NOVEL KEYWAY CUTTER

to open over a $\frac{3}{8}$-in. dowel, the dowels being so placed as to bring the gaps about 6 in. apart.

Northern Pacific Shop

A keyway or splining cutter which gives good satisfaction in the Northern Pacific shop at South Tacoma, Wash., is shown in Fig. 5. This cutter was used on an old Bement splining machine. The cutter is flat with the center about $\frac{1}{64}$ in. lower than the outside cutting edges. A diagonal slot was cut across the face of the cutter as shown, and the angular faces are of course backed off, so as to give the cutting edges *A* and *B* a little rake. This form of cutting edge gives a shearing cut which is very satisfactory. The tool runs in the direction of the arrows.

The link grinder shown in Fig. 6 is not new, but on the other hand is not particularly common. It consists of a grinding machine made on the order of an old style horizontal milling machine with its spindle adjustable vertically. This necessitates the arrangement of the idler pulleys shown at *A* for preserving the belt tension at different heights of the spindle.

The truck *B* is mounted on four wheels with V-grooves

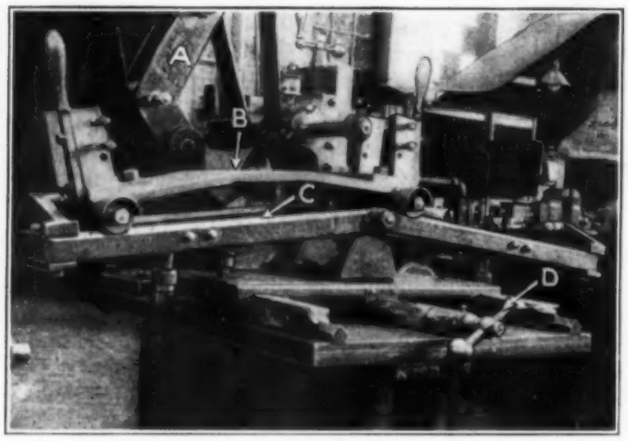


FIG. 6. A LINK GRINDER

which run on the track *C*. It is of suitable size to handle all the links to be ground and has handles at each end for conveniently moving it from one end to the other.

The track *C* is hinged in the center and adjustable at the ends in order to secure the different radii in the various links. The method of adjustment is easily seen. Spring bumpers are provided at each end of the track. The whole work-carrying unit can be moved to and from the grinding wheel by means of the crank *D*, so as to cover any part of the surface with the grinding wheel. This device is in the shop of the Northern Pacific Railway at South Tacoma, Washington.

Drafting Room Notes

By F. C. Edwards

On page 17 of the *American Machinist*, John S. Watts makes some pertinent remarks under the above heading. There are, indeed, very few firms engaged in engineering production in which an appreciable leakage is not constantly taking place through failure on the part of the drafting room to clearly realize the requirements of the shops for economical manufacture.

No disparagement of the drafting room, however, is intended in this article, which aims at suggesting an effective remedy for the ills referred to.

It is not so uncommon as it ought to be to find on the arrival of drawings in the shops that one or two slight alterations in design (quite immaterial, perhaps so far as the finished article is concerned) make all the difference between cheap and costly production. It may be that a component is perfectly designed so far as its ultimate purpose is concerned, yet, from the point of view of its manufacture it would deserve to be termed execrable.

The Evils of Specialization

Since specialization is a necessity of the age we live in, this common complaint, as we may call it, naturally tends to become more and more aggravated. The designer of today is fully occupied in dealing with the technicalities of his own special line of business in order to keep abreast of competitors. At the best, he can obtain only a comparatively meager insight into up-to-date practice in pattern shop, foundry, jig and tool work, machining and assembling. For it is not humanly possible for any one man to become really proficient in all these branches, as each branch demands constant and unremitting study for its efficient pursuit. Nevertheless, perfection in engineering design obviously hinges upon a clear conception of its several requirements.

What, then, is the remedy? It logically follows, that, in all but the simplest of new designs, the various departments affected should contribute their quota of suggestions and criticisms, and, so far as practicable, each phase of manufacture should be decided by its own expert. Each departmental chief, being *au fait* in the latest practice in his particular line and fully cognizant of the possibilities and limitations of his own shop, should be consulted before the drawings are issued to the works, or preferably, while they are still in the unfinished stage. Adjustment can then be easily made and possible conflicting requirements of the various shops harmoniously settled. The chief designer, being, of course, responsible, will have the final word on contested points.

Finally, the design will actually be the collective embodiment of all available individual experience, and its transition to the finished article by the path of least resistance will be insured.

Ideas From Practical Men

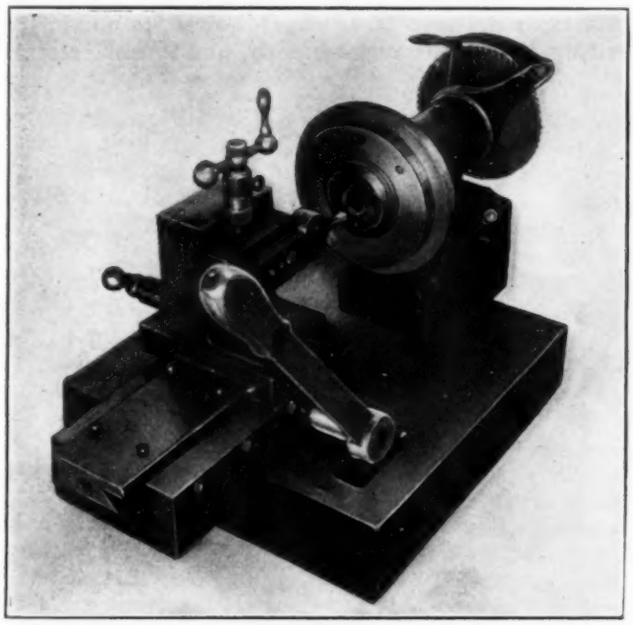
Devoted to the exchange of information on useful methods. Its scope includes all divisions of the machine building industry, from drafting room to shipping platform. The articles are made up from letters submitted from all over the world. Descriptions of methods or devices that have proved their value are carefully considered and those published are paid for.

Device for Cutting Teeth in Dies for Clock Wheels

By Amos Ferber

The small subpress dies for blanking and shaving the gear wheels for clocks are of necessity made very accurately with respect to tooth contour and spacing, and it would be impractical to follow the usual method of filing to line; therefore, broaching is the method not infrequently used to make them.

A master broach is an expensive proposition in itself and to justify its cost there must be demand for many



DEVICE FOR SPACING TEETH IN CLOCK WHEEL DIES

dies of one size and shape. In some cases, as in special and experimental work, this demand does not exist, and to make such dies quickly and accurately, Fred Lux, of the Lux Clock Co., Waterbury, Conn., devised the little machine shown in the illustration.

The rotating member is built very much like the headstock of a standard bench lathe except that it has no pulley for driving it, and is made to fit the bed of such a lathe; the center line of the spindle coinciding with that of the bench lathe and being driven from it by means of a wire held in the collet chuck of the latter. The die holder is located upon the faceplate of the device by dowels and a die may thus be set in place, bored and faced in the bench lathe, and then the head transferred to the base upon which it is shown for cutting the teeth.

The spindle takes various index plates for spacing different numbers of teeth and the toolslide has movement in three directions so that plain, spur or ratchet teeth may be cut by adjusting the position of the tool sidewise, and any diameter of die within its range may be accommodated by the up and down movement. Adjustable stops limit all movements so that the tool may be displaced if necessary and returned to position with certainty. The stop on the longitudinal movement prevents overrunning and possible breakage of the cutting tool.

Cutting a Keyway in a Large Pulley

By H. Beard

We recently had occasion to cut a keyway 2 in. wide by 20 in. long in the hub of a pulley 6 ft. 6 in. in diameter with a 7-in. bore.

There was no machine in our town big enough to do the job in any ordinary way, so we dug a hole in the ground in front of a small planer and, by means of bolts, jacks and straps, fastened the pulley to the legs of the planer in such a position that the bore was in line with and just above the level of the table.

A crosshole was made near the end of a short length of 3⅛-in. shaft to take the cutter, this hole being fitted to the cutter for a distance of a little over 3 in. of its length, while the remainder was tapped for a 1-in. setscrew with which to feed the cutter. A ⅝-in. setscrew tapped into the end of the shaft was made to bear upon the cutter hard enough to hold it in place, but was not set up so tightly as to prevent it from moving when the 1-in. feed screw was turned.

The shaft was then clamped to the table of the planer with the end carrying the cutter projecting through the bore of the pulley. Putting plenty of scrap iron on the back end of the table to keep it from tilting up, and arming the operator with a wrench to fit the 1-in. screw, we were ready for business.

The cutter was set to cut upward at the top of the bore, and faced toward the planer to cut on the forward stroke. We thus had a regular "draw-cut" shaper. Each time the end of the bar came through the bore on the return stroke the operator would take a turn on the feed screw.

By using several cutters we were able to do a good smooth job. The time consumed was six hours, more than half of which was consumed in the setting up. But we had the satisfaction of doing a better job in less time than could have been done with hammer and chisel.

Cap Bulging Tools

By S. A. McDonald

The accompanying drawings illustrate a rather unusual die for forming a bead on the neck of the tin cap shown.

In Fig. 1 *A* is a holder containing the knockout *B*. The cast-iron shoe *C* is formed so that the hardened tool steel die center *D*, the tool steel stripper ring *E* and the cast-iron retaining ring *F* are all concentric. The spring *G* fits in a seat turned in both the ring and shoe to centralize the pressure. A rubber collar *H*, held in

place by the center bolt *I*, is made a little smaller in diameter than the die center.

The die operates as follows: The cap is set in the stripping ring *E*, as shown. When the punch descends the knockout *B* comes down on the cap and through

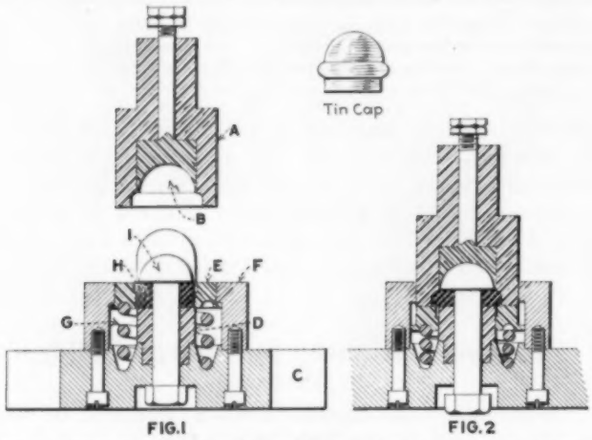


FIG.1 FIG.2

FIG. 1. THE CAP BULGING TOOLS. FIG. 2. TOOLS AT END OF STROKE SHOWING BULGING ACTION OF RUBBER RING

the cap forces the stripper ring down, thus forcing the inside of the cap on the head of the center bolt *I*. As the punch continues to descend the underside of the bolt head compresses the rubber collar so that it bulges out the cap, as shown in Fig. 2. The stripping ring holds the bottom of the cap from spreading. When the punch ascends the cap stays in the punch until near the end of the stroke, when the knockout forces it out.

The dies are run practically dry, as any oil on the rubber collar would decompose it.

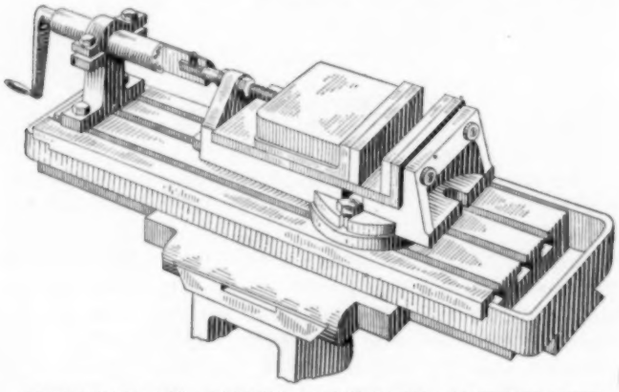
The rubber collar must be changed occasionally on account of being spread from continued use.

Extension for Screw of Milling Machine Vise

By R. Grant

In the article on tool engineering, page 801 of *American Machinist* under the heading "Quick Removal of Work," appears this statement. "When the regular type of milling machine vise is used, every half revolution of the screw means that the operator is obliged to remove his wrench and replace it again. This takes time and is a decided objection, if the jaws need to be opened rapidly."

The above objection to the regular type of milling machine vise, so commonly used, is removed by the use of a simple device that I made for myself during the war-time rush to meet this same condition. It consists merely of an extension piece, as shown in the sketch, broached at one end to fit the squared end of the vise-screw and squared at the other end to take the regular wrench, or crank handle.



EXTENSION FOR SCREW OF MILLING MACHINE VISE

The extension is long enough to reach out over the end of the milling machine table, is supported near the end of the table by a suitable bracket casting, and is retained in place by a headless setscrew which tightens against the flats of the vise-screw. This device permits the vise to be opened as rapidly as may be desired.

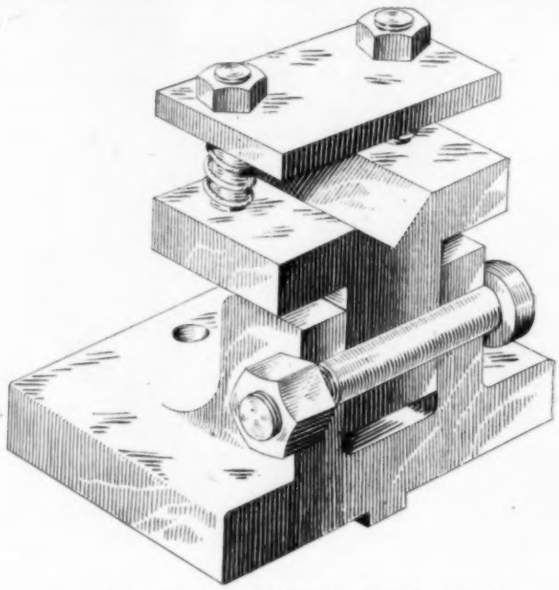
Adjustable V-Block for the Milling Machine

By Richard H. Kiddles

A handy V-block for holding pieces at an angle upon the table of the milling machine is shown in the illustration.

The tongue and groove that hold the block in angular position should be of ample proportions and nicely fitted, so that the position will not be changed by the action of the cutter, and to secure a firm grip the holding bolt should be of generous size.

A taper pin may be added, if desired, to obtain the setting for various angles quickly, and to make certain



ADJUSTABLE V-BLOCK FOR THE MILLING MACHINE

that the work will not move under the cut, but this is not absolutely necessary as the friction should be sufficient.

Jig for Resharpening Small Drills

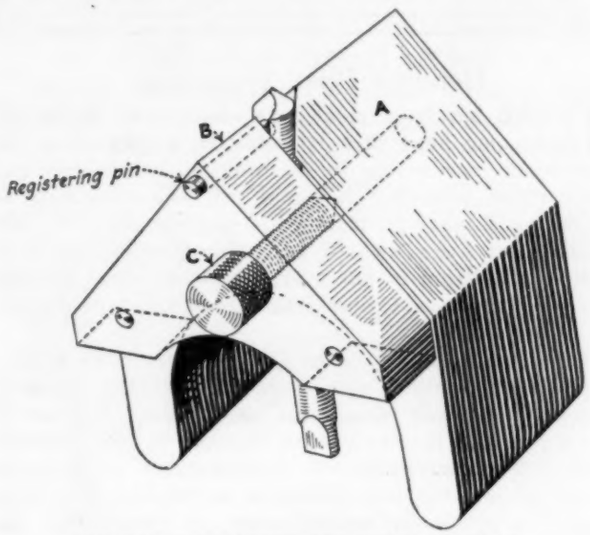
By Richard F. Moore

In the shop where I am employed there are a very large number of small twist drills used, ranging from number 75 to 70, and the resharpening of these drills constituted a considerable item of expense; besides which, if the resharpening was not done exactly right, the drills would not cut to size.

After some experimenting, the device shown in the illustration was made to facilitate this work, and now the resharpening is not only rapidly done, but almost anybody can do it without risk of error.

The block *A* was made with a small V-groove to suit the size of the drill, and the cover plate *B* fitted to

it with dowels so that when the screw *C* was tightened the cover would just clamp the drill in the *V* and keep it from turning. A register pin in the cover plate, made to fit the flute, located the drill in the right position, and it was necessary only to put the drill in the device,



JIG FOR RESHARPENING SMALL DRILLS

tighten the screw, and pass an oil stone over the beveled surfaces until the lips of the drill, which were set to protrude slightly, were stoned down flush with the hardened surfaces.

It required skillful work, of course, to get the registering pin in exactly the right position with reference to the beveled surfaces, but when finished, anybody could use the tool.

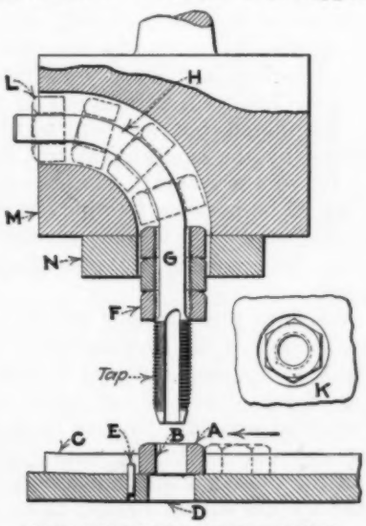
Tapping With a Bent Tap

BY C. W. FRANK

A time saving tap, driver and chuck which avoids the necessity for backing the tap out of the work is shown herewith. The pieces being tapped are cold-drawn nuts, but it is possible to apply this method to various kinds of work providing the outside is of uniform shape.

The feature of this tap is that the work passes over its entire length and at the same time acts as a holder and driver allowing sufficient float.

The illustration shows a nut *A* which is to be tapped at *B*. The nut is fed in the direction indicated by the arrow between two guides *C*, which prevent it from turning while the tap is passing through it. A clearance hole is provided in the plate *D* and a stop pin *E* is used to give the work an approximate location. The tap is brought down through the work until it has reached the position *F* at which time it is free to float on the shank. It is necessary to have the shank of the tap *G* smaller than the root diameter of the thread in order that the work will not bind. The shank of the tap is curved as at *H* to suit the size of the work and the body of the chuck has a hole with a similar curve allowing ample clearance as shown at *K*. It is necessary to have a number of pieces of work on the shank of the tap in order to form a positive drive. Each time a nut reaches the position *F*, a previously tapped one drops out at *L*.



HOW THE BENT TAP WORKS

In making the body *M* it is advisable to use two pieces of stock, machining half of the curved hole in each piece. A plate *N* is used in order to allow the first or second piece of work to steady the tap.

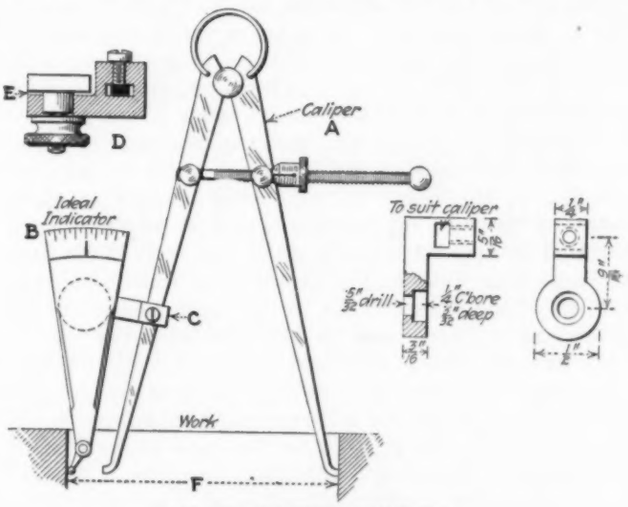
A pulley tap with a shank the right length for this kind of chuck can sometimes be bought, but if it cannot be obtained an additional shank must be welded on the end of the tap.

This method of tapping has been used on work ranging from $\frac{1}{16}$ to $\frac{3}{8}$ in. and the results obtained are surprising.

An Indicating Caliper

BY GENE PHELPS

The art of calipering a hole correctly requires considerable skill and experience. Very often, two men will obtain different dimensions due to the individual



AN INDICATING CALIPER

sense of touch. Devices have been brought out which involve a direct reading caliper having pointers or dials built directly on the caliper, but very few have been brought out for using standard indicators and calipers for correct measurements of holes.

A very simple arrangement which has been used by the writer with considerable success is shown in the illustration. The caliper *A* and the indicator *B* are standard products and are connected with each other by the bracket *C*. A detail of this bracket is shown in the lower portion of the drawing, and at *D* in the upper part is shown a section through the arm with the caliper and indicator in place. Note that the caliper has clearance, as shown at *E*, in order to prevent cramping. In measuring the diameter of a hole as shown at *F*, the caliper is put in the hole and adjusted until the indicator reads zero. The same reading is then taken across the points of the indicator and caliper by using a micrometer, which gives the diameter.

The bracket is a simple piece to make and will prove to be a very useful device for the toolmaker's kit.

EDITORIALS

Forty-Four Years of Usefulness

PERHAPS there is a lack of due modesty in the head we have picked for these remarks on the occasion of our birthday anniversary, but the feeling that our forty-four years of existence have been well spent, in the main, is encouraged by certain letters written to us and about us by our friends. One says, and his opinion on any point is one that we value highly, "We have learned to love the *American Machinist* because of its close intimacy with the machine tool industry. It has become a permanent adjunct to our business and we would be lost without it."

Forty-four years, measured in terms of modern industrial development, is a very long time. The old timers who have followed the *American Machinist* throughout its career, which began in November, 1877, have seen revolutionary changes in machinery and in the ideas of those who use it. The modern machine has greatly lightened the burden of human toil, not only in quality but in quantity as well. The hours which constitute a day's work now would have been looked upon with scorn by the early readers of the paper, but the output of each man would have excited wonder if not awe.

It may be, as some claim, that the workman of today has too much time on his hands in which to get into trouble, as the result of producing enough in eight hours to provide for himself and his family a comfortable living. But if such is the case, isn't it the duty of those who have had advantages to educate him in the use of his leisure hours for the improvement of his mental and spiritual equipment? We believe so and we feel that assisting in such education is part of our job.

It would be pleasant to be able to chronicle an equal advance in the science of business, but unfortunately we are still in the grip of the business cycle with its wild upward surges and calamitous declines. Without our background of alternate depression and prosperity the present outlook from the bottom of the deepest depression of all would be very black, but the *American Machinist* has lived through other depressions in its forty-four years, doing its best at all stages of the game to help the players to success. So now that we are beginning the climb of the next upward slope the future looks ever brighter and we have only the hardships of the last few months to warn us that unless we study the principles underlying the conduct of business with more care than we have before, the coming period of prosperity will be followed by another depression. Here again we stand ready to help in the economic education of our industry.

Forty-four strenuous years have seen the coming and going of many editors and business managers. Each has done his part and passed out of the immediate service of the paper, but the *American Machinist* has gone on to carry the word of progress and achievement to the men of the machinery industry everywhere. Much has been accomplished but there is much more ahead. Who shall say what marvels can be looked back upon when another forty-four-year period has passed?

Genuine Open Diplomacy

THERE has been much talk about open diplomacy and some hope that it would be employed in the conference now sitting in Washington, but nobody had the faintest idea that it would get such an airing as Secretary Hughes gave it in his opening address. Mr. Hughes has scored heavily in the first round and is in a strong position to put over any other plans he may have in readiness for settling the other controversies to be discussed.

It is our feeling that the United States will be met halfway by England and Japan in the matter of naval armament. Their people are at least as anxious as ours to reduce the tax burden imposed by the construction and maintenance of dreadnoughts and battle cruisers and here is a chance to accomplish it. Then, too, it is gradually coming home to people that the capital ship is an obsolete weapon where the opponent is possessed of airplanes and chemicals. This question has not yet been settled by the naval expert but its answer is quite evident to the man who pays the bills. As we pointed out in these columns some weeks ago, the tests on the Alabama were about as conclusive as tests can ever be.

Even the most belligerent nation could afford to give up its battleships so long as it was allowed to keep its airplane factories and chemical works. Potentially military aviation and chemical warfare are far more deadly than naval conflicts and there is no practical way of limiting the preparation for them. The airplane factory will produce more and more commercial airplanes of improved design as time goes on and this means of transportation comes into its own and the chemical works will turn out its nitrates for the farmer and its dyes for the textile makers. Either can be turned to military use at short notice. Mr. Hughes wisely said nothing about either in his address.

From the militaristic point of view, then, there can be little opposition to the secretary's proposal. What of the economist?

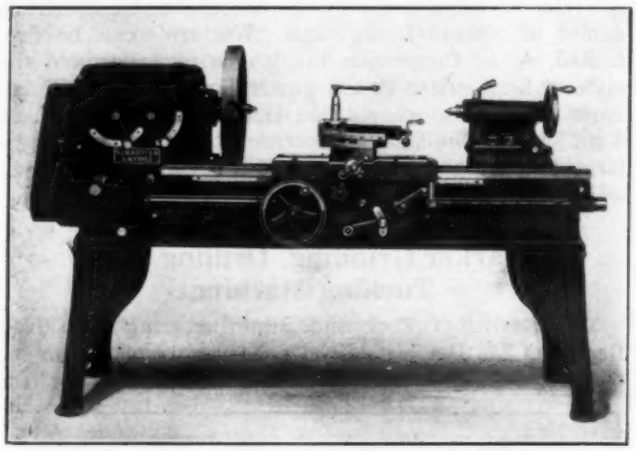
Some writers have already gone so far as to estimate in dollars and cents the savings that will result from the American armament reduction program. They run into the hundreds of millions in direct taxes which can be eliminated, but who can estimate the amount to be earned by the capital that will be released for the industry of the world? There is even a fair chance that it would be possible to wipe out the world debts if this capital were used to good account. It seems useless to carry the economic argument further, it is far too one-sided.

We have given rather materialistic reasons here for the success of the administration plan, not because they are the only ones but just to add the substantial backing of cold facts to our heart-felt sympathy with the President and Mr. Hughes in their stand for reducing the chances for future wars. We speak for ourselves and for the American machinery industry when we say that we are solidly behind them in their endeavor and confident of their success.

Shop Equipment News

Sebastian Type-S Lathes

The Sebastian Lathe Co., Cincinnati, Ohio, is placing on the market a line of lathes designated as the Type S, the machines being particularly intended for heavy



SEBASTIAN 18-IN. GEARED-HEAD TYPE-S LATHE

production work. The lathe is of the quick-change type, and is made in swings of 13, 15 and 18 in. It can be furnished in either the geared-head or cone type, the former being illustrated.

The bed has four V-ways in the 13- and 15-in. sizes and 2 V-ways and two flat ways in the 18-in. size. The bed can be furnished in lengths from 5 to 14 ft. in the two smaller sizes of machines and from 6 to 14 ft. in the largest size. The cone type of headstock is semi-inclosed, so as to increase rigidity. The cone pulley is turned on both the inside and outside. The spindle is hollow. All of the gears are covered. The back gear can be thrown in and out of engagement by means of a cam operated by a handle at the back of the machine. Lubricating facilities are provided both on the spindle and on the back gear shaft.

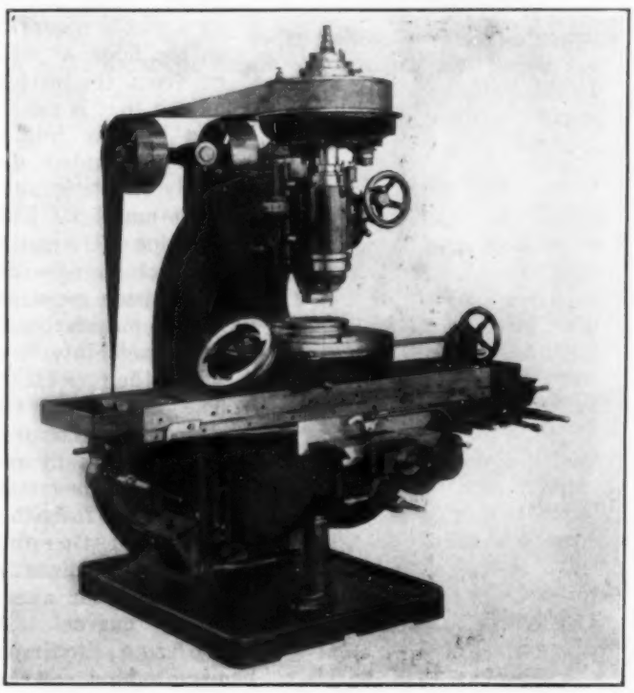
The geared headstock provides speeds from 19½ to 487 r.p.m. for the 13- and 15-in. sizes, and from 14 to 350 r.p.m. for the 18-in. size. All of the gears in the headstock are made of steel, are fully inclosed and run in lubricant. The geared headstock can be used with a double, friction countershaft or with a motor drive, the motor being mounted on the top of the headstock. In this latter arrangement, the motor is ordinarily connected to the spindle by means of silent chain, although a belt tightened by means of an idler can be employed. The tailstock is of the open-side pattern, allowing the compound rest to swing parallel over the ways and over the base of the tailstock. It has an adjustable side movement for taper turning.

The carriage is provided with T-slots on both the front and rear wings. The carriage and the apron are so joined by means of a long key as to provide accuracy of alignment and rigidity. The power crossfeed is of the pull type, and engages the gears from the side. A thread chasing dial is regularly furnished. The mechanism in the apron is strongly built, and is provided with facilities for lubrication. A safety device prevents the simultaneous engagement of both feeds. In doing plain turning, the half-nut is not engaged, but the motion is derived from the lead screw by means of a key running in a spline. The threads of the lead screw are used only when cutting threads on the work. The lead screw is 1⅜ in. in diameter, and a cast-iron clamp nut is used to engage the feed. The compound rest is graduated on the base, being provided with a guard on the rear to prevent chips from accumulating. A European style of toolpost can be furnished instead of the standard toolpost, if desired.

The quick-change box provides for the cutting of threads from 3 to 48 per in., and gives feeds from 6 to 96 per inch. All of the gears in the box are made of steel, and there is provision made for easy oiling. The lathe is ordinarily equipped with a quick-change box, compound rest, large and small faceplates, center rest, centers, as well as the necessary wrenches. Any special attachments that are ordinarily applied to a lathe can be furnished. The countershaft furnished ordinarily provides one speed forward and reverse, although it can be utilized to provide two speeds in one direction, in case the reverse is not necessary.

Becker No. 5C High-Speed Vertical Milling Machine

The Becker Milling Machine Co., of Hyde Park, Mass., has recently arranged its No. 5C vertical milling machine so that, on special order, spindle speeds up to 1,400 r.p.m. may be obtained and cutters as small as 7/32 in. may be successfully used. The normal range of speeds for this machine is from 13 to 500 r.p.m., the



BECKER 5C HIGH-SPEED MILLING MACHINE

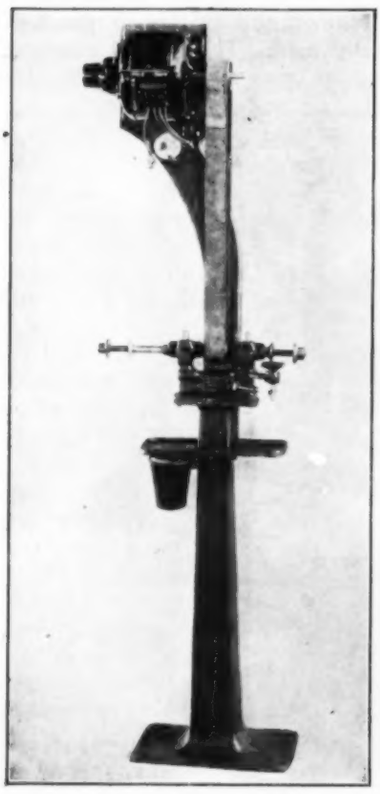
high speeds added not interfering with them, so that the machine may be used for all usual jobs and also be promptly available for the high-speed work. This feature is added because it is sometimes necessary to do light milling on pieces of work so large as to require a large size of machine merely to accommodate them. Large table dimensions and throat clearance may be desirable, although a smaller machine would be preferable because of the higher spindle speeds required for small cutters.

A special three-speed countershaft is furnished, with one shipper for obtaining the regular speeds, and another for the high speeds. A special composition drive belt is used, and sight-feed oilers are placed at bearings.

In the work shown in the illustration, a groove $\frac{3}{8}$ in. wide x $\frac{1}{4}$ in. deep is milled tangent to the circular wall previously milled, and about 1 in. below the top face of the work. Because of the necessary extension of this frail cutter from the spindle face, a special bracket is bolted to the spindle head, to which bracket is attached a bushing for supporting the cutter close to the surface being milled. The job as shown does not require a large throat clearance, but a larger size of this diehead cam 30 in. in diameter requires nearly the maximum clearance, which is 18 in. from the center of the spindle to the frame.

St. Louis Belted Motor-Driven Grinders

The St. Louis Machine Tool Co., 932 Loughborough Ave., St. Louis, Mo., has recently adapted its line of floor grinders and polishing machines to belted drive by means of individual overhead electric motors. The accompanying illustration shows the arrangement of the motor, it being carried on a heavy arm fastened to the rear of the pedestal. It is claimed for this arrangement that the driving motor is protected from the dust and dirt that ordinarily accumulates on a motor mounted on the floor, as well as from the action of grit that is apt to find its way into a motor mounted directly on the spindle of the machine. The addition of the motor does not increase the floor space required by the machine, and does not interfere with the operator. The motor and its supporting arm are, of course, easily removable. The motor is of the fully inclosed dust-proof type, and ordinarily furnished for alternating current. A 3-phase, squirrel-cage motor can be furnished, or else a single-phase motor capable of operating on either 1, 2 or 3-phase current, and at either 110 or 220 volts. Where necessary, direct current motors can be furnished. The starting switch is mounted directly beneath the motor.

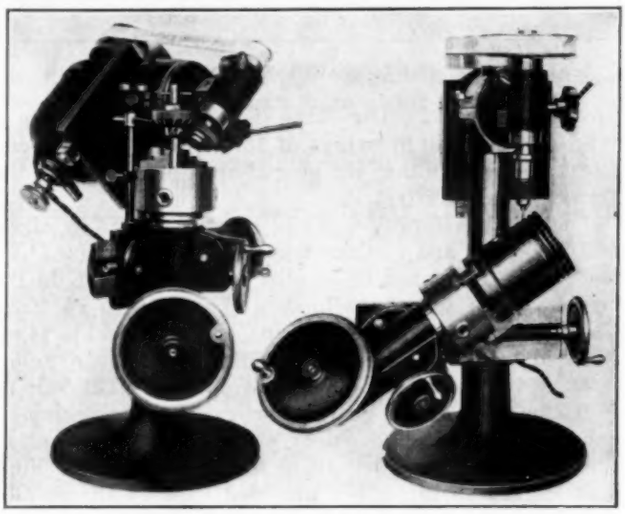


ST. LOUIS MOTOR-DRIVEN GRINDER

The machine can be furnished with practically any type of head used on the regular line of grinders and polishers made by the concern. It is ordinarily arranged to run the grinding wheels at 5,000 and the polishing wheels at 7,500 ft. per minute. The machine shown in the accompanying illustration is a combination type, having one grinding and one polishing wheel. All sizes of heads made by the concern under the trade names of "Saint Louis" and "Western" can be furnished, so as to provide the length of arbor and the style of head suited to any particular work. The maximum sizes of the wheels that can be carried vary from 6 x $1\frac{1}{2}$ in. on the smallest machine to 12 x 2 in. on the largest machine. The complete machines range in weight from 150 to 345 pounds.

Parker Grinding, Drilling and Turning Machine

The Ex-Cell-O Tool and Manufacturing Co., 1214 Beaubien St., Detroit, Mich., has recently placed on the market a fully universal bench machine, under the name of the Parker grinding, drilling and turning machine. The upper spindle head can be set at any angle about a horizontal axis, being directly connected to the $\frac{1}{4}$-hp. motor, which latter can be furnished to run from the lighting circuit. The lower spindle can also be set at any desired angle.



PARKER UNIVERSAL MACHINE GRINDING A CUTTER AND DRILLING A HOLE

The lower spindle can be driven by belt from a small pulley on the lower end of the motor, the belt running on a double idler pulley fastened to a spring on an adjustable shaft so as to give the proper belt tension in any position. This shaft and idlers are not mounted in the views shown. The upper spindle has $1\frac{1}{2}$ in. travel; the lower spindle has $2\frac{1}{2}$ in. vertical travel, $8\frac{3}{4}$ in. vertical adjustment and 7 in. horizontal travel. The upper, or grinding spindle, is equipped with ball bearings. The lower spindle has a full-length straight bearing, with a 45-deg. taper head providing $\frac{1}{2}$ in. bearing for thrust. The lower spindle is equipped with a 4-in. universal scroll chuck, and also with a 6-in. faceplate. The machine weighs 135 lb., and is 24 in. high.

Both external and internal grinding operations can be performed, as well as any class of cutter grinding. An idea of the grinding range of the machine can be obtained from the fact that it is used for grinding the outside diameters of automobile pistons, and also for grinding holes as small as $\frac{1}{8}$ in. in diameter. It is adapted to grinding automotive valves. On the left of the accompanying illustration it is shown grinding a cutter for refinishing the valve seats on cylinder castings.

By inserting a tool in the lug to the left of the upper spindle, small turning operations, such as regrooving pistons and turning small armatures, can be handled. An overhanging center bracket can be furnished with the machine.

By placing a drill chuck on the upper spindle instead of the abrasive wheel, small drilling or milling operations can be performed, as shown on the right of the illustration. A large pulley to reduce the speed for this purpose is furnished. The high speed possible with the machine is said to make it a very sensitive drill press.

Hirth Minimeter

The Coats Machine Tool Co., Inc., of 110 West 40th St., New York, N. Y., is placing on the market a complete line of the original Hirth minimeters suited to various applications in the ball-bearing, automobile, typewriter and sewing-machine industries. Recent additions to the line are shown in the illustrations.

The minimeter proper, to be seen at the right of Fig. 1, consists of a lever having unequal arms and resting on two knife edges. A series of levers with their bearings is not employed, thereby avoiding the play due to the presence of a film of oil or to movement on dead centers, which might affect the precision of the instrument. The arc described by the pointer attached to the longer lever arm depends upon the distance between the two bearing points of the knife edges. The ratio may, therefore, be adjusted as desired. The lever is held on the knife edges by means of a spring, which brings the pointer back to the normal position after the reading has been taken. A uniform contact pressure is thus assured.

The entire mechanism is protected from dust by a steel tube, and the upper part is provided with an opening that permits the graduated scale over which the pointer moves to be seen. The ratio of amplification is 1:50, 1:100, 1:200, 1:500 or 1:1,000, depending on the accuracy to which it is desired to gage. The upper measuring anvil of the minimeter is provided with a trip lever which, on being lightly pressed with the finger, permits free entrance of the piece to be gaged, thus avoiding considerable wear on the contact points.

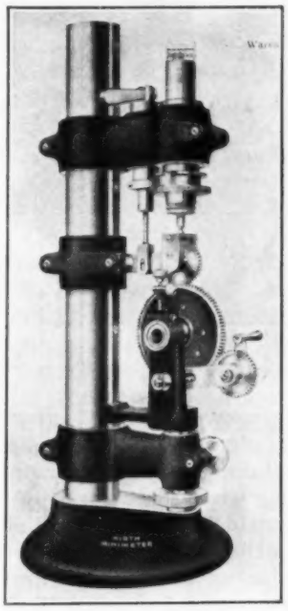


FIG. 2. MINIMETER FOR GEAR TESTING

The measuring instrument proper can be mounted in different types of holders. In one adaptation, in which the minimeter is held on a column over a small table, an instantaneous raising of the minimeter of about $\frac{3}{8}$ in. is effected by means of a lever. This arrangement permits the gaging of grooved and slotted parts, as, for instance, the circular grooves of end-thrust bearings, the depth of the groove being quickly checked at any point.

Another application of the minimeter is the inspection of balls requiring high accuracy. The housing of the minimeter forms a clamp which facilitates the setting. Fine adjustment is obtained by means of a micrometer screw below, while the back-stop, also movable, serves as a guide for the ball to be measured. Holders can be furnished which may be bolted either directly to the machine or to the wall.

The type shown on the left of Fig. 1 is intended for measuring holes up to $1\frac{13}{16}$ in. in depth and from $\frac{3}{4}$ to $2\frac{3}{4}$ in. in diameter. This instrument is equipped with a telescopic sleeve, interchangeable three-point gaging head and three back-stops. The other recent model, shown in Fig. 2, is suited to the field of gear inspection. The instrument is intended for checking the pitch and the tooth flanks of spur gears. There are three sizes ranging from $\frac{3}{4}$ to $8\frac{5}{8}$ in. in the diameter of the gear measured, and from $\frac{3}{8}$ to $1\frac{7}{8}$ in. width of tooth.

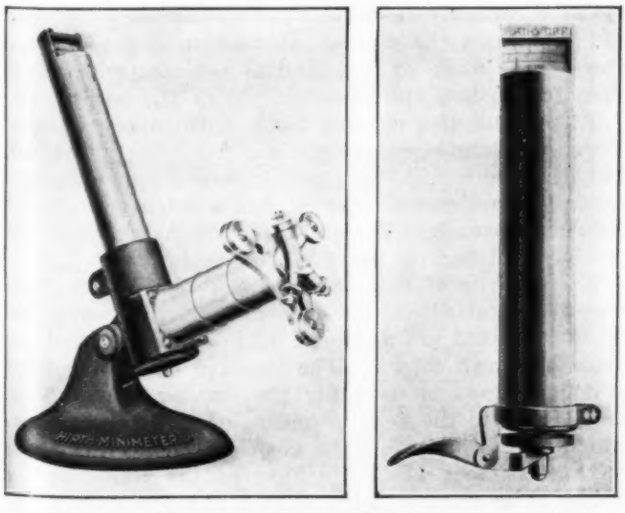


FIG. 1. HIRTH MINIMETER AND MOUNTING FOR BORE TESTING

Silberberg Time-Study Watches

The Mortimer J. Silberberg Co., Peoples Gas Bldg., Chicago, Ill., has recently placed on the market a decimal-graduated, two-handed, computing, time-study watch, shown in Fig. 1. The dial of the watch is graduated in tenths and hundredths of minutes, and contains figures, spaced 0.02 min. apart and distinctly legible, that indicate at any point of elapsed time exactly what the output per hour totals on the work in process.

A sliding stop is provided by which the watch may be started, stopped and started again without returning the hands to the zero position; an additional "plug" on the left side of the case makes it possible to stop one hand without interfering with the other. The time required for multiple operations and portions of operations can be determined by operating the two hands in sequence without at any time returning the hands to zero. The hand on the small dial records the total elapsed time up to 30 minutes.

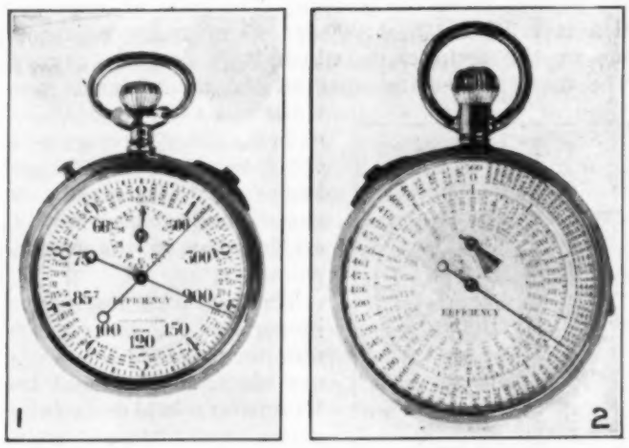


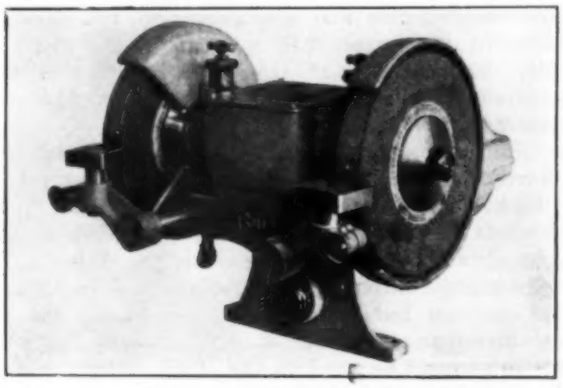
FIG. 1. SILBERBERG SPLIT-HAND TIME-STUDY WATCH.
FIG. 2. "DECIMAL DURATION" WATCH

The watch shown in Fig. 2 is known as the "decimal duration" type. The dial is graduated in tenths and hundredths of minutes and contains figures that indicate at any point of elapsed time what the corresponding output per hour is. The outside circle on the dial is colored in red and the figures thereon denote production per hour for any observation up to and including one minute. The central circle is colored in black, and the figures thereon denote production per hour for any operation of longer duration than one minute, but not exceeding two minutes. The inner circle, which is colored in blue, contains figures denoting production per hour for any operation of longer duration than two minutes, but not exceeding three minutes.

The small sector of a circle on the upper central portion of the face contains a small hand, which records the revolutions of the large hand up to and including 30 minutes. A sliding control button on the side of the case allows the observer to start the watch, stop it, and start it again without returning the hand to the zero position. This makes it possible to eliminate from the total the time consumed in delays on the work, so that when the operation is completed, the time shown will be the net time of the operation. Pressing down the crown brings both hands back to zero.

Black & Decker 8-In. Electric Bench Grinder

The Black & Decker Manufacturing Co., Baltimore, Md., has just brought out the 8-in. electric bench grinder shown in the illustration. The machine carries two wheels, and has a ¾-hp. universal motor, capable of operation on either alternating or direct current. The motor is air cooled, and arranged so that the cooling-air intake is located 12 in. from the grinding wheels, in order to reduce the possibility of grit being drawn into the machine. The machine is grease lubricated throughout.

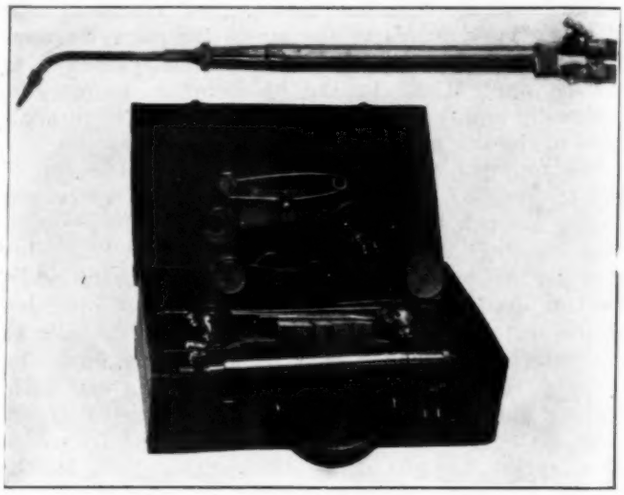


BLACK & DECKER 8-IN. ELECTRIC GRINDER

The grinding wheels, which are set well forward of the motor casing, are arranged so that they overhang the bench. This makes it possible to grind long pieces and odd shapes without interference from the casing, and also to wear the grinding wheels down to the clamp washers before discarding them. The machine is equipped with two 8 x ¾-in. grinding wheels, one coarse and one fine, two wheel guards, two adjustable toolrests, and an electric cable fitted with an attachment plug and switch.

Davis-Bournonville Garage Welding-Torch Outfit

The Davis-Bournonville Co., Jersey City, N. J., has recently placed on the market an oxy-acetylene welding torch and carrying outfit, especially for use in garages and small machine shops. The outfit is intended for repairing broken metal parts of all sorts, and is said to be capable of handling the usual types and sizes of welding work encountered in the small shop.



D-B GARAGE WELDING OUTFIT

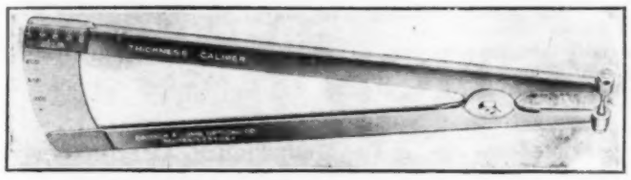
The accompanying illustration shows the case open and illustrates the manner of packing the apparatus. The case is made of fiber and is provided with partitions for holding the various units of the outfit. The outfit consists of a welding torch, with three extension tubes, one decarbonizing tube and five tips; an oxygen and a hydrogen regulator, with hose and connections; a spark lighter; colored glasses, and a torch wrench and regulator wrench. Various types of rods and fluxes can be furnished for use with the torch.

The torch is of the concern's No. 7000 style. It is shown assembled in the illustration. The extension tubes furnished are 5, 10 and 15 in. in length, and are made of drawn copper. The tips are made of copper, although brass is used for the smaller sizes. They are secured to the head by means of a fine-thread nut, which is said to provide a gas-tight connection. The mixing chamber is in the head of the torch, and is stated to be so constructed as to give a perfectly mixed gas. The gas tubes are silver soldered in position in both the head and rear ends of the body, and the

needle valves, which are quick-opening, are also silver soldered in place. The regulators are of the standard type, one being for the oxygen and the other for the acetylene. If desired, regulators having two gages can be furnished, one gage indicating the working pressure and the other the tank pressure.

Bausch & Lomb Thickness Caliper

The Bausch & Lomb Optical Co., Rochester, N. Y., has recently placed on the market the thickness caliper shown in the illustration. The device is intended to give



BAUSCH & LOMB THICKNESS CALIPER

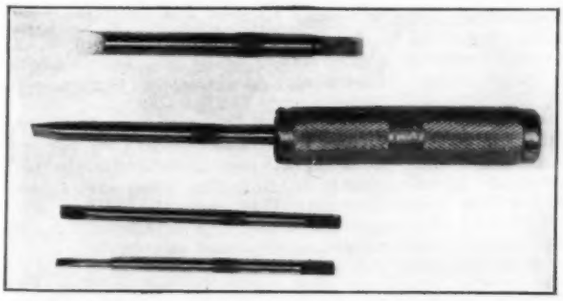
a means of easily measuring diameters or thicknesses, being originally developed for determining the thickness of lenses. The two legs of the device are of U-form, to give strength. The pivot is provided with a bronze bearing adjustable for wear.

The measuring points are made of hardened steel, the ends being given a spherical form. A locking screw adjustment is provided at each point. The scale fastened to one of the legs is made of German silver, and can be supplied with two different styles of graduation. The caliper illustrated is graduated to read in thousandths of an inch. It can be graduated to read in tenths of a millimeter, if desired. The maximum capacity is 12 mm. or ½ in.

Consolidated Tool Works Screwdriver Set

The Consolidated Tool Works, Inc., 296 Broadway, New York, N. Y., has recently placed on the market the No. 60 screwdriver set shown in the illustration. The tool is intended for heavy work and is strongly made. Four hardened and ground tool-steel blades are provided, the widths being ⅛, 5/32, ¼ and 5/16 inch. The handle is turned from a solid bar of cold-rolled steel, being knurled to provide a grip.

The blades are interchangeable in the handle, the two smaller blades being fitted at one end and the two



CONSOLIDATED NO. 60 SCREWDRIVER SET

larger ones at the other. They are secured without the use of any moving jaws, being merely pushed in place and withdrawn by pulling them outward. The blade is prevented from turning in the handle by a stop which bears against the flat surface on the tang. The method of gripping is positive and permanent, but permits of very quick changing of the blades. The assembled tool is 6½ in. long; the blades themselves are 3½ in. in length. Each set is packed in a brown canvas bag, so that it can be conveniently carried.

Hogarty Identification Tag

The L. J. Hogarty Co., 5 Beekman St., New York, N. Y., has recently placed on the market the identification tag shown in the accompanying illustration. The device is intended for use by toolmakers and machinists in general, where one man is not assigned permanently to one machine.

Each operator has one tag. The tag bears the name and check number of the man, the former being stamped on a metal band so fastened on the tag that it can be easily removed and replaced by another band in case an employee leaves the concern and is replaced by another. When an operator starts to use any machine in the shop, he attaches to it his identification tag, which indicates that the machine is occupied. This method is intended to display the more common one of putting a tool or cutter in a machine to show that the latter is in use, or else being held for future use. Since each man has but one identification tag, it is not possible for an operator to reserve more than one machine at a time. In case that it is necessary for him to temporarily proceed with other work, such as at a bench, the tag indicates that the machine is in use. The display of the tag on the machine assists timekeepers, foremen and inspectors in checking up the operations and the work of the men. It is stated that the displaying of the operator's name gives him a greater sense of responsibility regarding the machine. On the face of the tag are printed some rules regarding the care and operation of machine tools. It is made of brass and is 2½ in. in diameter.

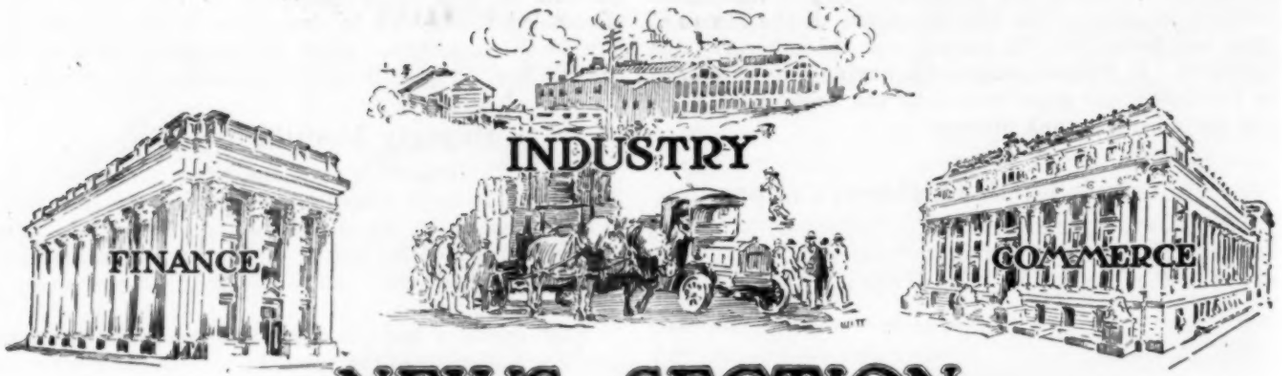
HOGARTY IDENTIFICATION TAG

Erratum

On page 695 of the *American Machinist*, under the title of "Critchley Expansion Reamer with Adjustable Pilot," the maximum size of a reamer recently placed on the market by Chadwick & Trefethen is given as 4½ in. This is a typographical error, and should be 1⅝ in.

Manganese Ore Deposits in Chile

There are numerous deposits of manganese in the Coquimbo and Atacama districts, according to Consular agent Edwin Salz. Years ago they were important sources of the world's demand for this ore, but due to competition from Brazil, their exploitation ceased entirely. During the three years previous to 1921 occasional shipments aggregating about 15,000 tons were made, but even these were discontinued because of the high ocean freight rates prevailing in 1920.



NEWS SECTION

Foundrymen's Exhibit at Cleveland Next Year

The next convention and exhibit of the American Foundrymen's Association will be held during the week of April 24, 1922. The association headquarters and exhibits will be in the new Cleveland Public Hall, which is rapidly nearing completion. The Institute of Metals Division of the American Institute of Mining and Metallurgical Engineers has announced that it will hold joint convention with the foundrymen, as has been the custom in years past.

Following an interval of eighteen months the next meeting promises to be of unusual interest and profit. The papers committee advises that manuscript copies are being received and that the first advance copies of papers to be presented at the convention will be mailed out in January.

At the coming exhibit will be displayed all the latest improvements and inventions in foundry equipment. Full detailed announcements with hotel and railroad rates will be made later.

Southern Railway to Reduce Freight Rates to Aid Iron Industry

Announcement by officials of the Southern Railway Co. that application has been made to the Interstate Commerce Commission for a 25 per cent freight rate reduction on iron ore and fluxing stone, applying to interstate commerce and intrastate transportation in Georgia and Tennessee, is regarded by the metal trades industries of the two states named as one of the most important rate reductions undertaken by any Southern road in some time. The reason for this lies in the fact that the present rates, which are regarded as unusually high, have been one of the main factors contributing to the decline in furnace operations in the South, and if the new rate becomes effective many of the plants that have stood idle for several months are expected to resume operations immediately.

If the application is granted by the I. C. C., rates in force will be the same as those of August, 1920, during which month the new higher rate went into effect which served to make furnace operation unprofitable. Shortly after that furnaces began to shut down and they have, in a large measure, since remained inactive. A great boom is expected if the cut is allowed.

Opening of a School for Time Study

The announcement of the Taylor Institute, 122 South Michigan Blvd., Chicago, Ill., that a course in time and motion study has been instituted under the direction and with the collaboration of several of the country's experts along this line, will be received favorably by production engineers throughout the country.

Although the application of time and motion study has become an important factor in modern production, the variations in the applications of these studies is well known. However, the need for men trained in this work is said to be greater than visible supply, and the means whereby the engineer can perfect himself in this work under the direction of able time study experts will be welcomed by every branch of manufacturing industry. The course of instruction, conducted by correspondence, covers ten lessons at intervals of one week each, and embraces such features as piece work, rate setting, accurate computation, production control, formulas and methods of figuring. The methods and formulas are in operation in some of the largest and best known industries in the country, and are the result of years of experience in this work.

Road Building Machinery at Good Roads Show in Chicago

An exposition that will embrace $1,500,000 worth of labor-saving road machinery will comprise the coming Thirteenth National Good Roads Show, at the Coliseum, Chicago, Ill., Jan. 17 to 20, next, to be held in conjunction with the twelfth American Good Roads Congress and nineteenth annual convention of the American Road Builders' Association. The exposition will demonstrate the marvelous growth that has characterized the American road building industry in the past decade. At a drawing for space on Oct. 29 more than 95 per cent of the 40,000 sq.ft. of space available for exhibits was taken, necessitating the rental of additional buildings to accommodate exhibitors now applying for space.

The program committee is now drawing up a strong program for the technical sessions of the congress and many road builders from all parts of the country will be asked to discuss matters of vital interest to contractors and to machinery manufacturers.

To Memorialize DeLamater-Ericsson Anniversary

March 9, 1922, will be the sixtieth anniversary of the battle of the "Monitor" and "Merrimac" at Hampton Roads, Va., which demonstrated the merits of the turreted battleship. That has been the date selected by the DeLamater-Ericsson Tablet Committee to memorialize the services of Cornelius H. DeLamater and Capt. John Ericsson, who for 50 years, 1839-1889, were pioneers in developing the naval, marine and industrial interests of this country, and who at the time of the civil war, without thought of personal reward, turned their mental and financial resources to account and applied their knowledge and experience to accomplish what the Government had failed to do.

The Government has appropriated $35,000, and private individuals have subscribed a larger sum for a memorial to Captain Ericsson in Washington adjacent to the Lincoln Memorial, and $5,000 is being raised by private subscription among engineering and marine interests to erect bronze tablets on four sites of buildings in New York City with which the lives and work of the two men were identified.

Mr. Isidore Konti is the sculptor, the Municipal Art Commission has accepted the design and the American Scenic and Historic Preservation Society will serve as guardian of the tablets.

Muscle Shoals to Supply Power for South

In order to relieve to some extent the shortage of hydro-electric power in Georgia, Alabama, Tennessee and North and South Carolina, the Alabama Power Co. will operate Dam No. 2 and the power plant in connection with it at the Muscle Shoals nitrate plant, leasing the property from the Federal Government. Shortage of power in the five Southeastern states named has been caused by the long dry spell which has lowered the rivers and streams to far below their normal marks, has resulted in the shutting down of a number of industrial plants operated by hydro-electric power and the curtailment of operations at many others.

By connections with the Alabama Power Co. and the Georgia Railway and Power Co. hydro-electric power is supplied to industries in the five states, and the situation will be somewhat relieved by operation of the Muscle Shoals plant, which has 90,000 hp.

The Business Barometer

This Week's Outlook in Commerce, Finance, Agriculture and Industry Based on Current Developments

BY THEODORE H. PRICE
Editor, *Commerce and Finance*, New York

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It is an old maxim in Wall Street that "the ticker tells the truth however others may prevaricate." If this be so then the record of the Disarmament Congress thus far should be regarded as encouraging, for nearly all the speculative markets showed an improving tendency and had a better tone last week.

While the rise in prices actually established is but small and is in most cases related to some particular trade factor previously unnoticed, it is plain that speculative readiness to take account of the hopeful has been greatly increased by the happenings at Washington.

As far as one can trace the processes of the collective mind this is due to the fact that it has become plain that public opinion throughout a war weary world will compel the acceptance of the proposals made by Secretary Hughes in fact as well as "in principle," and that despite diplomatic maneuvering over the difficulties of the Eastern question a reduction in naval armament sufficient to permit of a substantial reduction in taxes will be agreed upon.

As to whether war will thereby be really made more remote seems to be rather a question of the sentiment expressed than of the vessels that are to be scrapped or abandoned, for even if they are all irrecoverably surrendered there is doubt whether the aggregate tonnage of the "capital war ships" of Great Britain, Japan and the United States will be much smaller than it was in 1914, just before the outbreak of the recent struggle.

The important thing is that civilization has declared itself as opposed to war for the present at least, and is determined to devote its activities to the constructive arts of peace. What this implies in the possible increase of wealth and purchasing power can be partially glimpsed from the recently published statement that through the invention of power producing and labor saving machinery the effective physical energy of the American people is now multiplied by 31, and that one half of this increase is attributable to the development of the present century.

This calculation is based upon the assumption that one "horsepower" is equal to the energy of seven and two thirds men. Put another way for the sake of clarity, it means that with the aid of water power, electricity, steam, gasoline and kerosene the machines and machinery now available in this country can do the work that would otherwise have required the unaided strength and labor of over 3,000,000,000 men. In other parts of the world the use of power and labor saving machinery in multiplying the efficiency of the individual has not advanced as rapidly as in America, but what has been achieved here can be approximated elsewhere and the figures will give an idea of how much more renowned than the victories of war the victories of peace may be, if the world is left free to fight for them.

It is a subconscious appreciation of these possibilities which have not previously, as far as I know, been so circumstantially set forth, that is responsible for the ground swell of optimism that is now noticeable everywhere.

Sterling exchange has advanced to $4 upon the belief that the economies that will follow disarmament will ultimately enable Great Britain to recover her financial equipoise. Cotton, wheat and our other exportable commodities, including copper, have advanced slightly in the expectation of an improved export demand.

Bonds are higher and a fifty million dollar issue offered by the New York Telephone Co. was enormously oversubscribed because the prospect of lower taxes, remote as it seems to be, assures an ultimate abundance of capital for private enterprise. Money is meantime still lower. The weekly statement of the Federal Reserve System shows a reserve ratio of 71.8 per cent a week previous, and a further gain of $7,000,000 in gold. The best commercial paper can be sold at 5 per cent and the call rate has fallen to 4 per cent.

The same conditions exist in London. The reserve ratio of the Bank of England is rising and the market rate for short time bills has fallen to 3⅞ per cent.

The ease of money and the renascence of hope are, as I expected, gradually inducing the purchase of other securities than bonds. A prominent New York banking firm is now advertising the attractiveness of preferred stocks, and shrewd speculators are in a quiet way buying the low-priced common stocks that are to be picked up on the Stock Exchange and elsewhere. The railway shares that pay no dividends are, however, still neglected, and it is in this quarter that the greatest opportunity of profit is probably to be found for it is plain that the position of the American transportation industry is rapidly improving now that the managers are tardily coming to realize that high rates work a reduction of both traffic and profits. Their recognition of this truth is evidenced by the reduction of 10 per cent in the rates on farm products outside of New England, and while the permanence of this reduction for more than six months is made contingent upon an order from the Labor Board that will permit of an equal reduction in wages within the same period, it is a safe bet that the old rate will not be reestablished. The next step ought to be a reduction in passenger and Pullman rates. There are intimations that it is being considered.

There are many other indications that commerce and industry are once more upon an even keel. Bank clearings for October were $30,263,000,000, as against $38,768,000,000 last year, the difference being more than accounted for by the decline in prices.

Distributive trade is normal, though not booming. There is every prospect of a good Christmas business. It is said that the winter residents are already on their way to Florida in large numbers and that over 10,000 people have already arrived at St. Petersburg. Bradstreet reports that building permits issued in 157 cities during October call for an expenditure of $167,000,000. This compares with $152,000,000 for 163 cities in September and $92,000,000 a year ago. These figures afford a partial explanation of the more cheerful reports that come from the steel industry, though they are also attributable to increased buying by the railways.

The foreign trade statement for October shows that our exports are holding up marvellously well considering the impecuniosity of Europe. They were $346,000,000. Imports were $183,000,000, leaving a balance of $163,000,000 in our favor, as against $146,000,000 in September. A balance of $2,000,000,000 is indicated for the calendar year. It is, however, unnecessary to adduce more statistics to prove that we are on the way to normal activity and prosperity. The barometer is rising and the glass seems set for fair weather unless either the Disarmament Congress or the Congress of the United States do something that will cause misgiving or doubt. Incidentally it is encouraging that the tax bill, such as it is, seems near its final passage. The House has accepted the Senate amendment fixing the maximum supertax at 50 per cent.

In Europe the Irish question and the probable insolvency of Germany, as indicated by the fact that marks are still selling at 39 cents per hundred in New York, still remain to trouble the foreign statesmen and financiers but these conditions have become chronic and like all chronic disorders they will ultimately become unbearable. There is, however, reason to hope that the rigidity of Ulster will shortly yield to the massage of Lloyd George and that he may be released to visit this country, where a warm welcome awaits him.

Obituary

Chester L. Lucas, advertising manager of *Machinery* for the Central West, died on Nov. 3, in Syracuse, N. Y. Mr. Lucas was born in Middleboro, Mass., in 1881. He learned the trade of engraving and die-sinking with the Schwerdtle Stamp Co., of Bridgeport, Conn., and was later connected with the John Robbins Manufacturing Co., Boston, and then with the General Electric Co., at Lynn, Mass. He joined the editorial staff of *Machinery* in 1911 and in 1918 took up the advertising work in which he was engaged at the time of his death. The machinery industry has lost a good friend and loyal supporter.

Business Conditions in England

By Our London Correspondent

Perhaps the best method of indicating the present industrial and commercial conditions is to examine briefly one or two company reports and similar documents that have recently been made public. The figures naturally relate to the workings of the past, but it is the immediate past and a pointer is shown as to the present direction of movement. In regard to shipping, one steamship company which had been in the habit of paying 10 or, more frequently, 15 per cent and even 20 per cent, now has to state that the bankers holding mortgages on the vessels covering an overdraft have declined to carry it longer, with the result that a new company is proposed, capital £100,000, to purchase the fleet of eight vessels at present prices. The overdraft is of £400,000. Then again in the case of another company which bought up a line at high prices, the chairman reported that debenture holders have taken possession and decided to sell the 15 ships. Here the loss is due not to trading, which has been profitable, but to the fall in the value of the vessels. The holders however find that, sold at current rates, the ships would not cover half the amount of debentures. It is stated that £450,000 will buy the boats, which cost the company a year or two ago more than £2,000,000. Another steam shipping company has written down the value of its fleet from £1,149,000 to £1,032,000, despite the fact that, owing to the acquisition of two new steamers, the tonnage has increased from 49,664 to 59,248. The net profits, at £176,266, show a decline of nearly $60,000 in the year. Further, the firm of Swan, Hunter & Wigham Richardson, Wallsend, recently published a statement that since the beginning of the year no new order had been received for ships, while the position was very nearly the same at associated yards at Walker, Glasgow and Sunderland, one vessel completed in the last yard having been sold at half the cost of building. Reference is made to a Cunarder finished in 1911 and another launched in 1921. At the former date the cost per ton of steel was £3.58 and the weight of steel worked per iron worker per week was 9.91 cwt. Ten years later the cost per ton was £11.73, and still rising, while the weight worked was 7.35 cwt.; in fact it is asserted that wages paid now amount to between three and three-and-a-half times the wages paid in 1911—compared with work done.

The shipbuilding decline is shown in the annual report just issued by Lloyd's Register. Here the new tonnage classed for the year ending with June last was 3,245,130, a reduction of 25 per cent compared with the preceding twelve months. While tonnage under construction was rather more than this, there has been a definite falling-off in new orders; in fact the reduction of late has been "so extensive as to indicate a slump in orders for new tonnage without precedent." The tonnage registered included productions of the United States, Japan, Holland, and the British Dominions, that of America (1,219,270) being slightly in excess of the British (1,163,590). Vessels representing 58 per cent of the total tonnage classed during the year were fitted for burning oil.

Coming a little nearer to engineering, Kayser, Ellison & Co., Sheffield, steel makers, show in their report for 1920-1921 a net profit of £14.375 as compared with £26,310 the year before. The net profits have in fact declined since 1916-1917. In the year 1917-1918 one hundred per cent in bonus shares was added to the 20 per cent dividend. This year the distribution is at the rate of 5 per cent. The net profits mentioned include the amount received by way of return of excess profits duty; despite this, the directors regard the report as not unsatisfactory. Yates & Thom, the Blackburn steam engine makers, appear to have done well, for they paid 5 per cent, put £10,000 to reserve and carried forward £15,084 as against £10,580 last year, when 10 per cent was paid.

Gwynne's Engineering Co., Hammersmith and Chiswick, in the west of London, the successors of the firm who for many years manufactured centrifugal pumps, etc., to which of late they added motor cars, was registered in 1920. It was stated on the certificate that the profits had been £243,447 for 11 months of 1917 and the first month of 1918, £141,982 for the following twelve months and £164,297 for the last 11 months of 1919. The report issued relating to the period ending with August last shows a loss of £103,164, this being raised to £351,887 by various payments, allowances for depreciation, writing-off formation expenses, and so on.

The Automotive Field

With reference to motor cars, the Austin Motor Co., being re-financed, is being taken out of the hands of the receiver and a scheme of arrangement for the reconstruction of Harper, Sons & Bean has been sanctioned by the courts. It may be added that both the commercial vehicle and pleasure vehicle shows held this year in London could not be fully representative of the industry, as the promoters of the show decided that firms against whom receiving orders had been made or who were in liquidation troubles could not partake. The pleasure car exhibition opened on Nov. 3, with 571 exhibitors, including makers of motor-boats, etc. Low price, with light cars, was the prevailing note.

Herbert Morris, Ltd., crane makers, Loughborough, show a trading profit, after payment of taxes, etc., of £70,878, comparing with £121,266 previously. The dividend is 10 per cent and it is pointed out that two years ago a bonus of 175 per cent in the form of ordinary shares was given to shareholders.

The latest machine tool firm to report, namely, Kendall & Gent, Ltd., Manchester, shows a debit balance of £5,030, despite the fact that £2,514 had been carried forward. The capital of the company is £130,000, £90,000 of which is held publicly.

Finally as regards companies, E. G. Wrigley & Co., Ltd., Birmingham, manufacturers of small tools and also motor car transmission gears, showed a loss during the year ending with April 30, the latest date available ,of £124,884. They had to carry forward from the previous year a debit balance of £67,021, and capital losses on investments in certain motor car companies and loans in connection with a steel foundry make a total loss of £548,330. To meet this the capital reserve is drawn on and the ordinary shares of the nominal value of 20s are to be written down by 12s, leaving the value at 8s, subsequently to be split into two shares each of 4s. Indeed it is now confidently anticipated that a number of industrial companies will have to reduce their capital accounts. Capital was inflated during the war and in the hectic period following. It is being recognized that much has disappeared and that in the future dividends can be paid only on reduced capital. People seem to be selling out of the companies for fear of the necessity of re-construction on a smaller basis.

There are some industries which, it is thought, have reached the bottom and are on the up-grade. This anticipation applies, not for the first time by any means, to the cotton trade where in some directions notice has been given of advance of retail prices. The coal industry is in a critical position and though drastic cuts have been made in the prices of iron and steel, at present they have not resulted in the closing of many orders. Pig iron prices as last reported are below the cost of production, but nothing in the way of forward buying can be reported. At the last meeting of the London iron and steel exchange it was stated that only one-third of the Sheffield steel furnaces are working. But, so as not to paint too dark a picture, good business was reported by black sheet makers and an improved demand by manufacturers of galvanized corrugated sheets, a steady influx of orders from India and the Far East being mentioned. A steel works in Wigan which had been shut for nearly a year has re-commenced operations, and the pressure of foreign competition in steels has lessened. An order worth one-and-a-half million pounds for water pipes received from Bombay is reported by a Birmingham firm.

Of the engineering industry nothing fresh can be said and, putting it roughly, with some exceptions the machine tool industry appears to be working say one-and-a-half days a week. India in certain directions has been a good friend to engineers, particularly in regard to the supply of iron and steel foundry plants. Developments of a competitive character in this direction are anticipated in the East. Then, too, judging by official reports, Australia has made up her mind to have her own manufacturing industries, and a Yorkshire woolen firm recently arranged to make a start there. But according to the commissioner reporting, Australia will need further capital and, in addition, will have to import specialized knowledge and ability to organize.

The problem of unemployment has led to special efforts by the government, including the allocation of £26,000,000 in connection with export credits and £25,000,000 by way of guaranteed loans; that is, the state will guarantee payment of principal and interest up to that extent of approved loans. In view of the volume of trade the sum is not particularly large, as can be gathered from calculations recently made of new capital subscribed even during the current year. In the 10 months this has amounted to more than £183,000,000, compared with £342,000,000 during the same period of last year. After a very large falling off during the summer, the figures show for October a very definite advance, due to cheaper money. The government is also devoting £12,000,000 directly to the unemployment problem, including funds for emigration facilities, contributions to dependents' funds, and grants for loans for relief work. A number of schemes designed to absorb the unemployed have been proposed and discussed, including the making of arterial roads and the extension of the London tube system. These however will not extend the overseas trade, on which Great Britain so largely depends.

Hoover and Feiker Champion Cause of Trade Associations

Despite the criticisms that have been heaped upon the trade associations and the disinclination on the part of the Department of Justice to attempt to clarify the situation prior to the decision of the Supreme Court in the hardwood lumber case, the Department of Commerce is actively championing the trade association idea. Secretary Hoover and members of his staff are taking pains in their utterances to show that the questionable conduct of a very few trade associations, or aggregations calling themselves trade associations, has resulted in uncharitable criticism of all trade organizations. Mr. Hoover has expressed himself so definitely on the subject that there can be no doubt that he believes trade associations are necessary to the maximum progress of industry. The rapid multiplication of trade associations until they number nearly 3,000 is interpreted by Mr. Hoover to indicate "a great and vital movement and something permanent in our economic system. The coming together of manufacturers and producers in the different trades for the purpose of the advancement of their industries as a whole, is a profound step toward co-operation in the whole business world. Out of it will be gained tremendous benefits for the business public as well as the particular industries.

F. M. Feiker, assistant to the Secretary of Commerce, in a recent public address said:

"The trade association is the natural organization functioning in the establishment of contacts between the government and industry. It is indispensable in such matters as the collection of statistics, the detailed promotion of foreign trade and in the elimination of excess variety. It is the only avenue that the Department of Commerce sees by which the Government can establish contact with a trade to the mutual advancement of fundamental interests.

Founders Celebrate Silver Jubilee in New York

National Association Discusses Questions of Moment—Gov. Allen, of Kansas, Scores Labor Leaders—Barr Re-elected President

With its usual frank and open discussions of the open shop movement of which it is one of the most prominent exponents, the National Founders Association held its twenty-fifth annual meeting at the Hotel Astor, New York, on Nov. 16 and 17. Over four hundred members attended. William H. Barr, the president, made the opening address and presided over each of the sessions.

Mr. Barr covered several topics in his address, but his definition of the causes for our present industrial ills was particularly well received. He said: "In searching for a simple explanation of the basic fault of the industrial situation both before and after the war, I can only sum it up in the two words, "politics" and "unionism."

"The hope today is that we are gradually purging industry of politics and unionism and the after effects of war. We are bringing to this contest the grim resolution of American business men to see the thing through, and we are mightily set upon correcting the conditions which have brought about the present situation. Let us not be too analytical as to the causes which promoted the present business conditions. Rather, let us accept the situation as it is and continue to work for normalcy. It is not an impossible fight and we possess everything that tends to make for victory. We have courage, a clean record, patriotism and the will to win."

An unexpected and unannounced speaker on Wednesday was Governor Henry Allen, of Kansas, who is best known for his establishment of the Court of Industrial Relations in that state, and who is a thorn in the side of every labor leader in the coal mining districts. The Governor, who was attending another conference in New York, was invited to address the Founders. He spoke extemporaneously, giving a brief history of the work of the court, the events leading up to its formation and the results so far attained by this unique tribunal. He said that twenty-nine out of the thirty cases which the court has decided, have been satisfactory to both litigants. He added that the popularity of the movement was evidenced by the fact that he has twice faced the people in general elections, and has been vindicated on each occasion by re-election. He praised the women of this state as the stabilizers of society and the greatest influence for good against the power of the radical element of union leadership.

A very interesting analysis of wage rates and living costs was presented by Magnus W. Alexander, managing director of the Industrial Conference Board. Mr. Alexander illustrated his remarks with charts showing the rise and fall of wages as related to the cost of living. His figures, taken from a survey of machine shops and foundries in the United States, showed that the average hourly wage rate in July, 1914, was 27.4 cents; in 1920, 63 cents; and in 1921, 56.1 cents. He also showed a decline of 13½ per cent in hourly earnings, 26.8 per cent in weekly earnings and 44.5 per cent in employment. He predicted a return to normal by the end of this winter and declared that the proper relation between money wages and cost of living was the only criterion of the economic status of the workers.

A most instructive paper on foundry costs was presented on Thursday by Robert E. Belt, secretary of the American Malleable Castings Association. Mr. Belt gave a thorough analysis of foundry costs as related to selling prices. In impressing his audience with the great value of proper cost supervision, he said that no matter how highly efficient was the technical administration of the product, the business could not be successful unless the cost of production is properly regulated. He urged the foundry-men to pay more attention to their cost systems.

At the conclusion of this program the convention passed a resolution urging better supervision of national transportation lines by the Government. The resolution suggested the appointment of a public tribunal before which all disputes on railroad matters, between employers and workmen, should be heard.

The election of officers resulted in the unanimous re-election of Mr. Barr as president. Mathew Griswold, of the General Electric Co., Erie, Pa., was chosen vice-president and J. M. Taylor, of Chicago, secretary. A. E. McLintock continues as commissioner.

Steel Treaters Meetings

The Board of Directors of the American Society for Steel Treating held an important meeting in the executive offices at Cleveland, Ohio, last week.

It was decided to hold two sectional meetings of the society during the coming year in addition to the regular annual convention. One meeting will be held in New York during January or February, and the other in Pittsburgh in May. These meetings will serve the members of all of the chapters located in that particular section and will continue for one or two days, at which a few well chosen pre-printed papers will be presented. There will be no exhibits at the sectional meetings.

The board further unanimously selected Detroit as the city in which to hold the next annual convention and exposition, on Sept. 25 to 30, 1922.

Manufacturers To Urge "American Valuation"

At a conference in New York City on Nov. 17, which was attended by over 200 manufacturers, plans were formulated for an organized fight to secure the passage of the American Valuation plan, as included in the Fordney Tariff Bill now pending in Congress. Among the speakers were John E. Edgerton, president of the National Association of Manufacturers, and George L. Markland, Jr., of the Philadelphia Gear Works.

It was decided to hold a monster convention, sponsored by the National association, in the Middle West. The date and other particulars will be announced later. At this meeting representatives from all elements favoring the plan will be asked to co-operate in crystallizing a strong sentiment.

"Industrial Waste" Theme of A.S.M.E. Annual Meeting Next Month

Announcing that a five-day annual meeting, which will bring together more than 2,000 engineers, educators, technologists and manufacturers from all over the country, will be held in this city Dec. 5 to 9, the American Society of Mechanical Engineers made public a statement by Herbert Hoover saying that the investigation of industrial waste recently completed by the American Engineering Council, of the Federated American Engineering Societies, has paved the way for an advance in American industry.

The findings of this council's Committee on Elimination of Waste in Industry, which was appointed by Secretary Hoover before he entered the Cabinet, will form the leading topic of discussion at the meeting of the mechanical engineers, who are arranging a national forum, at which Mr. Hoover has been invited to preside. Speakers from many cities will participate in a program embracing a wide range of subjects of public, technical, and social import. Education will be the theme of special sessions.

The leading session of the meeting will be held Monday afternoon, Dec. 5, at the Engineering Societies Building, 29 West 39th St. Conditions in five basic industries "assayed"—to use Mr. Hoover's favorite description—by the American Engineering Council's committee, headed by J. Parke Channing of New York, will be discussed. The industries include the metal trades, printing, clothing, boots and shoes and building. Health of industrial workers, stressing the importance of care of the eyes, now made a national safety movement under the guidance of the Eyesight Conservation Council of America (of which L. W. Wallace, executive secretary of the American Engineering Council, is president), will be a principal feature of the waste discussion.

On Monday evening the society will hold a session on education and training in the industries. Among the speakers will be Prof. R. L. Sackett, dean of engineering at Pennsylvania State College. Tuesday morning, Dec. 6, simultaneous sessions on railroads, power, and machine shop practice will be held. At the power session the speakers will include C. H. Berry and F. E. Moreton, of Detroit; C. W. E. Clarke, of New York; Ernest L. Hopping, of Philadelphia; and J. H. Lawrence and W. M. Keenan, of New York.

At the session on railroads addresses will be delivered by James Partington of the American Locomotive Co., New York; Walter C. Sanders of the Equipment Engineering Department, New York Central Lines; and William Elmer, of Altoona, Pa. Speakers at the machine shop session will include Prof. John Airey of the University of Michigan, and J. A. Smith of the General Electric Company, Schenectady, N. Y. Mr. Smith, with J. J. Callahan, of Worcester, Mass., will speak on "Waste in Machine Industry." Prof. Airey will discuss "The Art of Milling."

On Tuesday afternoon, Dec. 6, there will be sessions on management and gas power. At the management session Walter N. Polakov, of New York, will speak on "Making Work Fascinating." Another speaker will be F. B. Gilbreth, of Montclair, N. J. At the gas power session addresses will be made by Elmer A. Sperry, of Brooklyn, member of the Board of Engineering Foundation and inventer of the gyroscope. Louis Illmer, of Lansdowne, Pa., will also address this session.

On Tuesday evening the presidential address will be delivered by the retiring president of the society, Edwin S. Carman, of Cleveland. Following this address, honorary memberships will be conferred upon Henry H. Towne and N. G. Herreshoff, yacht designer and builder.

Sessions of the fuel and material handling divisions and of the student branches of the society will be held Thursday morning, Dec. 8. The society, it is announced, now maintains branches in fifty-nine colleges and universities with a membership of 2,220. The total membership of the society was given as 15,353, a marked increase being recorded in the past year.

Speakers at the fuel session will include D. E. Jacobus and W. B. Chapman, of New York; Joseph Harrington, of Chicago, and Victor J. Azbe, of St. Louis. At the material handling session the question of co-operating with the state and national governments, with the Engineering Foundation, the National Research Council and other agencies in spending $1,000,000,000, will be discussed.

On Thursday afternoon a joint session with the Society for the Promotion of Engineering Education will be held on "Professional Engineering Education for the Industries." The speakers will be F. C. Pratt, vice-president of the General Electric Company and president of the Yale Engineering Society; J. E. Otterson, president of the Winchester Repeating Arms Co., New Haven; Dexter S. Kimball, president-elect of the American Society of Mechanical Engineers, vice-president the American Engineering Council and dean of engineering at Cornell; A. G. Christie, professor of mechanical engineering at Johns Hopkins. A general session of the society on Thursday will be addressed by Maj. Gilbert D. Fitch, of New York, and Robert F. Wood, of Bayonne, N. J.

On Thursday evening the society will give a dinner and dance at the Hotel Astor. On Friday morning sessions of the textile, ordnance and aeronautic sections will be held. The program for the ordnance sessions will take up the recent army demonstrations at Aberdeen, Md., in which the mechanical engineers co-operated. Among the speakers at the aeronautic session will be R. R. Moore, chief of the Physical Testing Branch, Engineering Division, Air Service, McCook Field, Dayton, Ohio. Orville Wright and other leading aviation authorities are members of the society's aeronautic division.

At the textile session Charles T. Main, of Boston, one of the deputation of thirteen engineers who went abroad recently in the interests of international engineering unity, will make a report on the second World Cotton Conference held in Manchester, England. B. R. Andrews of Boston will discuss "Economy in Textile Drying" and Thayer A. Gates, Providence, R. I., will take up "Hidden Wastes in Textile Mills." On Friday general sessions of the society will be addressed by F. N. Dean, of Boston; L. A. Quayle, of Cleveland, and Paul A. Bancel, of New York.

"Perfect Packages" for Shipping Machinery

Nation-wide interest in careful and secure packing of shipments has been stimulated by the activities of the carriers of the country in the recent "Perfect Package Campaign." The railroads, steamship lines and express companies, and the Post Office Department joined in the movement. The purpose of the drive was to bring the shipping methods of the American commerce to such a high standard that hereafter the huge economic losses, due in part to careless packing by shippers, will soon be a negligible factor in the transportation industry.

Before the recent "Perfect Package Campaign," the transportation lines suffered losses in excess of $150,000,000 a year, and a great deal more, during and immediately after the war.

The carriers take the stand that they do not wish to dictate to shippers just how they shall pack their commodities. In fact, they do not consider themselves expert in packing, and feel that the shippers know more about the packing of their own goods than any of the carriers. But the carriers do believe that they are expert on imperfect packages, for they can see for themselves when shipments break down. The question of just what a "perfect package" is for various commodities shipped by rail is a debatable one, but generally speaking, the carriers ask that "shipments be so prepared or packed as to insure safe transportation, with ordinary care on the part of the carrier."

A recent study by transportation men of the packing methods of machinery has developed the following suggestions:

The proper preparation of machinery and machine parts for shipment by express is a task usually assigned to an experienced mechanic, except, of course, when the shipment consists of a standard article for which a standard package has been adopted and which may be put together by an inexperienced person. In this latter class may be included sewing machines, washing machines, churning machines, etc.

When the article is small and properly braced in its own case, such as check writers, typewriters (portable) and talking machines (small), corrugated and fiber board give satisfaction as outside containers. When packed in wooden boxes or crates all fragile parts should be protected from direct contact with cleats, etc., and all loose parts secured to prevent shifting and possible damage. Wooden cleats covered at point of contact with pads of felt, in addition to securing the stand of the machine to the bottom of the box by means of screws, offer protection against damage in transit and possible damage by consignee in removing the article from the case.

Large machines and parts of same are frequently secured to skids or a platform, which will not withstand the strain caused by the weight of a machine being stressed on center when ends only are supported, as for instance when a shipment is being transferred from a car to a truck. Frequently the bearings or cast-iron frames are not covered to prevent injury from hard knocks incident to handling unwieldy objects of this kind in the limited time allowed at small stations.

Business Items

The Clearfield Machine Co., Clearfield, Pa., is preparing to move into its new foundry now completed at South Fourth and Spruce Sts. The foundry is connected with a Pennsylvania Railroad siding and gives the Clearfield firm the largest advantage of this kind in this section of the state.

The Schmick Gear and Screw Co., which will manufacture a new worm driven screw automobile jack, invented by E. E. Schmick, has been incorporated under the laws of the State of Delaware. The firm manufactures both at Reading and Williamsport, Pa.

The Wayne Oil Tank and Pump Co., Ft. Wayne, Ind., has issued its ninety-first consecutive common stock dividend.

The Clark Tool Works, Inc., Belmont, N. Y., is the new name assumed by the former Clark Machine Works. The new organization will manufacture a complete line of metal-cutting band-saws.

The Wetmore Mechanical Laboratory Co., of Milwaukee, Wis., has been reorganized and is now engaged in general engineering and manufacturing work, specializing in the production of the Wetmore inserted blade expanding reamer. The company will also develop a line of fixtures, jigs and tools, dies and screw machines.

The Rusfal Manufacturing Co., Philadelphia, Pa., has purchased the machine shop and equipment of the James Carr Co., also of that city. With the added facilities the former company will continue to manufacture grinding lathes and tools for opticians, and special machinery.

Rogers, Brown & Co., of New York, have undertaken the distribution of Noral virgin aluminum in the United States. The firm has arranged with producers in Norway to handle the metal exclusively in this country.

The Newcomb Spring Corporation, Brooklyn, N. Y., has acquired the rights, good-will and title of the Reliance Spring and Manufacturing Co. E. L. Newcomb has assumed the presidency of the new company. Present officers are located at 238 West 40th St., Brooklyn, N. Y.

The Ames Shovel and Tool Works, at Elwood, Ind., closed since the middle of June, recently opened the factory in full operation. About 150 men will be employed at the start. The American Sheet and Tinplate Co. has started all of its twenty mills, the capacity of the plant. This means employment for 1,500 persons.

The W. K. Milholland Machine Co., of Indianapolis, Ind., has filed a final certificate of dissolution with the secretary of state.

For the purpose of manufacturing automobile accessories and tools the Poole-Wetz Manufacturing Co. has been organized at Columbus, Ind. The organizers are C. E. Poole, J. D. Wetz and D. A. Wetz.

The Symplex Lock Rim Co., of Petersburg, Ind., which is engaged in manufacturing luggage holders for automobiles, will add new machinery to its plant and expand the business of the concern.

The Hare's Motors of Connecticut, Inc., of Hartford, Conn., recently filed a voluntary petition in bankruptcy. The Hare's Motors, up until last September, had charge of the Locomobile Company of America, of Bridgeport, Conn.

The Morris Metal Products Corporation, with a plant in Bridgeport, Conn., has recently voted to change the name of the company to the Bridgeport Company, and a certificate of change has been filed with the Secretary of State. The Morris Metal Products Co. sometime ago bought the old Bridgeport Projectile Co.'s plant which was operated by them previous to the entry of the United States in the World War, and after that by the American Can Company.

The Plainville Castings Co. of Plainville, Conn., is having an addition of brick, concrete and steel construction put on its castings shop plant. It is expected that the new building will greatly enlarge the facilities of the company.

The Quinnipiac Foundry, Inc., of New Haven, Conn., has recently been incorporated to engage in the manufacture of brass, bronze, etc., castings. The incorporators are Arthur B. O'Keefe, L. J. Clawson and W. M. Higgins.

Engineers have recently been making surveys at Bessemer, Ala., for the new half-million dollar plant it is reported the Tennessee Coal, Iron and Railroad Co. plans to construct there for the manufacture of construction bars and shapes. While no definite announcement regarding the project has been made by officials of the company, it is reported that the plant is a virtual certainty and will include several units, representing an investment said to be approximately $500,000. It will be almost as large as the company's present rolling mill at Bessemer.

Preparations are being made to rebuild the plant of the Bowie Stove Works, at Rome, Ga., recently destroyed by fire, it is announced by J. M. Berry, an official of the company. The new foundries and shops will be larger than the former plant. The name of the concern will be changed to the Rome Range and Stove Co.

The Machinery Supply Co., of San Diego, Cal., which has been doing business for four years under a co-partnership consisting of Harold Scott and W. H. Fraser, has been incorporated under the name of the Machinery Pipe and Supply Co., with a capitalization of $100,000, with Mr. Scott as president and Mr. Fraser as secretary and general manager. The company will move from its present location, 340 7th St., to a new plant which is being specially constructed with side-track facilities and occupying 10,000 sq.ft. of ground space. A year and a half ago Paul O. Vance and Charles B. Wincote, formerly with the Western Metal Supply Co., joined the Machinery Supply Co., and are now taking an active part in its business. The company at present is doing a business reported at $30,000 a month. Marion B. Hart, formerly with the Western Metal Supply Co., is now the corporation salesman. Three other salesmen are kept in the field all the time, the company covering the territory south of Los Angeles.

Personals

WALTER C. REED, has recently been chosen general manager of the Pittsfield Machine and Tool Co., Pittsfield, Mass.

FRED ATWATER, secretary-treasurer of the Columbia Nut and Bolt Co., Bridgeport, Conn., was elected mayor of that city, at the November election. Mr. Atwater, a Democrat, went in with a majority of over 4,000 votes over the republican nominee, Mayor Clifford B. Wilson, who has held the office for the past ten years.

JOHN PARKER, has recently been elected treasurer of the Pittsfield Machine and Tool Co., of Pittsfield, Mass.

FRED E. HOLTZ has been appointed representative in the Milwaukee district for the W. A. Jones Foundry and Machine Co., of Chicago, Ill. Mr. Holtz has been general sales representative for the company for the past two years.

EARL G. GUNN, of Detroit, formerly of the Packard Motor Car Co., has been appointed designer of Colonial Motors, Inc., Windsor, Ontario, Canada. Mr. Gunn is an executive of the Society of Automotive Engineers.

ALBERT G. FLAGSTAD, sales engineer of the McDonough Manufacturing Co., Eau Claire, Wis., has been transferred to Alexandria, La., where he will handle the line of McDonough heavy-duty saw machinery.

FRANK M. GERMANE, for many years associated with automotive industries, has resigned as director and sales manager of the Morlin-Rockwell group of ball bearing manufacturers. Mr. Germane's plans for the future have not been announced.

A. C. BISGOOD, formerly with Purinton & Smith, Hartford, Conn., has been appointed sales manager of the Standard Machinery Co., New Haven, Conn.

LOUIS R. KRUGER, previously with the E. E. Fulton Co., Chicago, Ill., has been appointed mechanical engineer and general superintendent of the Angsten-Kox Co., Michigan City, Ind.

Obituary

FREDERICK E. SMITH, partner in the firm of Barney & Smith, car builders, of Dayton, Ohio, died on Nov. 7 at Pasadena, Cal. He was 77 years old.

JOHN SHIELDS, 64 years old, president of the Atlantic Basin Iron Works, Brooklyn, N. Y., died on Nov. 1 in a New York hospital.

Forthcoming Meetings

The annual meeting of the Taylor Society will be held in the Engineering Societies Building, New York City, on Dec. 1, 2 and 3.

The annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, New York City, on Dec. 5 to 9.

A dinner-meeting of the Metropolitan section of the S. A. E. will be held at the Automobile Club, New York City, on Dec. 15.

The Weekly Price Guide

This Week's Market

The minimum on structural steel shapes, plates and bars at the Pittsburgh mills continues to be quoted at $1.50 per 100 lb. for large tonnages. Steel shapes are quoted at $1.55@$1.60; plates at $1.65 and bars at $1.60 per 100 lb. in small tonnages. Mill shipment quotations remain unchanged. New York warehouse prices on structural shapes and plates are quoted at $2.78 as against $2.88; bars at $2.68 as compared with $2.78 per 100 lb., formerly.

Electrolytic copper is quoted at 14c. as against 13⅝c. and tin at 29½c. as compared with 28½c. per lb., previously. Brass and copper tubing and brass sheets and rods have advanced ½c. per lb. Long terne plates have dropped ½c.; charcoal-plates 1c. and coke-plates 1½c. per lb. in New York warehouses. Zinc sheets have dropped 1c. per lb. in Cleveland and linseed oil has advanced 2c. per gal. in Chicago.

IRON AND STEEL

PIG IRON—Per gross ton—Quotations compiled by The Matthew Addy Co.:

CINCINNATI	
No. 2 Southern	$22.50
Northern Basic	22.02
Southern Ohio No. 2	23.52
NEW YORK—Tidewater Delivery	
Southern No. 2 (Silicon 2.25 to 2.75)	28.50
BIRMINGHAM	
No. 2 Foundry	18.00
PHILADELPHIA	
Eastern Pa., No. 2x, 2.25-2.75 sil	23.26
Virginia No. 2	28.74
Basic	20.75
Grey Forge	22.50
CHICAGO	
No. 2 Foundry local	21.70
No. 2 Foundry, Southern, sil 2.25@2.75	24.66
PITTSBURGH, including freight charge from Valley	
No. 2 Foundry	22.46
Basic	20.96
Bessemer	21.96

SHEETS—Quotations are in cents per pound in various cities from warehouse; also the base quotations from mill:

Blue Annealed	Pittsburgh, Large Mill Lots	New York	Cleveland	Chicago
No. 10	2.25@2.50	3.53	3.10	3.38
No. 12	2.30@2.55	3.58	3.15	3.43
No. 14	2.35@2.60	3.63	3.20	3.48
No. 16	2.55@2.80	3.73	3.30	3.58
Black				
Nos. 17 and 21	2.75@2.85	3.80	3.55	3.95
Nos. 22 and 24	2.80@2.90	3.85	3.60	4.00
Nos. 25 and 26	2.85@2.95	3.90	3.65	4.05
No. 28	2.90@3.00	4.00	3.75	4.15
Galvanized				
Nos. 10 and 11	2.90@3.00	4.00	3.75	4.15
Nos. 12 and 14	3.00@3.10	4.10	3.85	4.25
Nos. 17 and 21	3.30@3.40	4.40	4.15	4.55
Nos. 22 and 24	3.45@3.55	4.55	4.30	4.70
No. 26	3.60@3.70	4.70	4.55	4.85
No. 28	3.90@4.00	5.00	4.75	5.15

WROUGHT PIPE—The following discounts are to jobbers for carload lots on the latest Pittsburgh basing card:

Steel Inches	Black	Galv.	BUTT WELD Inches	Iron Black	Galv.
1 to 3	68½	56	¾ to 1¼	44½	29½
LAP WELD					
2	61½	49	2	39½	25½
2½ to 6	65½	53	2½ to 4	42½	29½
7 to 8	62½	49	4½ to 6	42½	29½
9 to 12	62½	49	7 to 12	40½	27½
BUTT WELD, EXTRA STRONG, PLAIN ENDS					
1 to 1½	66½	55	1 to 1½	44½	30½
2 to 3	68½	56			
LAP WELD, EXTRA STRONG, PLAIN ENDS					
2	59½	48	2	40½	27½
2½ to 4	63½	52	2½ to 4	43½	31½
4½ to 6	62½	51	4½ to 6	42½	30½
7 to 8	58½	45	7 to 8	35½	23½
9 to 12	52½	39	9 to 12	30½	18½

Malleable fittings. Classes B and C, Banded, from New York stock sell at net list. Cast iron, standard sizes, 20–5% off.

WROUGHT PIPE—Warehouse discounts as follows:

	New York Black	New York Galv.	Cleveland Black	Cleveland Galv.	Chicago Black	Chicago Galv.
1 to 3 in. steel butt welded	60%	46%	60½%	47½%	60%	46%
3½ to 6 in. steel lap welded	51%	37%	58½%	44½%	57%	43%

Malleable fittings. Classes B and C, Banded, from New York stock sell at list less 5%. Cast iron, standard sizes, 32% off.

MISCELLANEOUS—Warehouse prices in cents per pound in 100-lb. lots:

	New York	Cleveland	Chicago
Open hearth spring steel (base)	5.00	6.00	4.28
Spring steel (light) (base)	6.00	6.00	3.68
Coppered Bessemer rods (base)	8.00	8.00	6.03
Hoop steel	3.53	3.14	3.28
Cold rolled strip steel	6.25	8.25	6.75
Floor plates	4.85	2.64@2.80	5.23
Cold finished shafting or screw	3.88	3.50	3.83
Cold finished flats, squares	4.38	4.00	4.35
Structural shapes (base)	2.78	2.64	2.88
Soft steel bars (base)	2.68	2.54	2.78
Soft steel bar shapes (base)	2.68	2.54	2.78
Soft steel bands (base)	3.28	....	3.48
Tank plates (base)	2.78	2.92½	2.88
Bar iron (2.00@2.25 at mill)	2.68	3.52	2.78
Drill rod (from list)	55@60%	55%	50%
Electric welding wire:			
3/32	8.50		12@13
1/8	7.15		11@12
5/32 to 1/4	6.75		10@11

METALS

Current Prices in Cents Per Pound

	New York	Cleveland	Chicago
Copper, electrolytic (up to carlots), New York	14.00		
Tin, 5-ton lots, New York	29.50		
Lead (up to carlots), St. Louis, 4.60; New York	5.00		
Zinc (up to carlots), St. Louis, 4.97½; New York	5.37½		
Aluminum, 98 to 99% ingots, 1-15 ton lots	25.00	20.00	20.00
Antimony (Chinese), ton spot	5.50	6.50	6.00
Copper sheets, base	20.75	21.50	22.50
Copper wire (carlots)	16.50	16.50	15.75
Copper bars (ton lots)	19.00	23.00	19.00
Copper tubing (100-lb. lots)	21.00	23.00	22.50
Brass sheets (100-lb. lots)	16.75	17.00	18.25
Brass tubing (100-lb. lots)	18.50	19.00	20.00
Brass rods (1,000-lb. lots)	14.75	16.00	15.25
Zinc sheets (casks), (8% dis. carlots)	11.00	10.15	15.75
Nickel (ingot and shot), Bayonne, N. J.	41.00	.....	.....
Nickel (electrolytic), Bayonne, N. J.	44.00	.....	.....
Solder (½ and ½), (case lots)	19.50	21.00	18.00
Babbitt metal (best grade)	27@30	39.00	34.00
Babbitt metal (commercial)	9.50	13.50	8.00

—Shop Materials and Supplies

MONEL METAL—Base price in cents per lb., f.o.b. Bayonne, N.J.:

Shot	35.00	Hot rolled machined rods (base)	53.00
Blocks	35.00	Hot rolled rods (base)	42.00
Ingots	38.00	Cold drawn rods (base)	56.00
Sheet bars	40.00	Hot rolled sheets (base)	55.00

SPECIAL NICKEL AND ALLOYS—Price in cents per lb.

Malleable nickel ingots	45
Malleable nickel sheet bars	47
Hot rolled rods, Grades "A" and "C" (base)	60
Cold drawn rods, Grades "A" and "C" (base)	72
Copper nickel ingots	37
Hot rolled copper nickel rods (base)	45
Manganese nickel hot rolled (base) rods "D"—low manganese	64
Manganese nickel hot rolled (base) rods "D"—high manganese	67

OLD METALS—Dealers' purchasing prices in cents per pound:

	New York	Cleveland	Chicago
Copper, heavy, and crucible	10.00	10.50	10.25
Copper, heavy, and wire	9.50	10.50	9.50
Copper, light, and bottoms	8.00	8.00	8.25
Lead, heavy	4.00	3.75	3.75
Lead, tea	3.00	2.75	3.00
Brass, heavy	6.50	6.00	8.00
Brass, light	5.00	4.00	5.50
No. 1 yellow brass turnings	5.25	5.00	5.25
Zinc	3.00	2.00	2.75

TIN PLATES—American Charcoal Plates—Bright—Cents per lb

		New York	Cleveland	Chicago
"AAA" Charcoal Melyn Grade:				
IC,	20x28, 112 sheets	20.50	19.00	18.50
IX,	20x28, 112 sheets	23.00	21.50	20.90
"A" Charcoal Allaways Grade:				
IC,	20x28, 112 sheets	17.50	16.75	17.00
IX,	20x28, 112 sheets	20.50	19.50	19.60
Coke Plates, Bright				
Prime, 20x28 in.:				
100-lb.,	112 sheets	12.50	13.00	14.50
IC,	112 sheets	12.80	13.30	14.80
Terne Plate				
Small lots, 8-lb. Coating:				
100-lb.,	14x20	7.00	6.25	7.25
IC,	14x20	7.25	6.50	7.40

MISCELLANEOUS

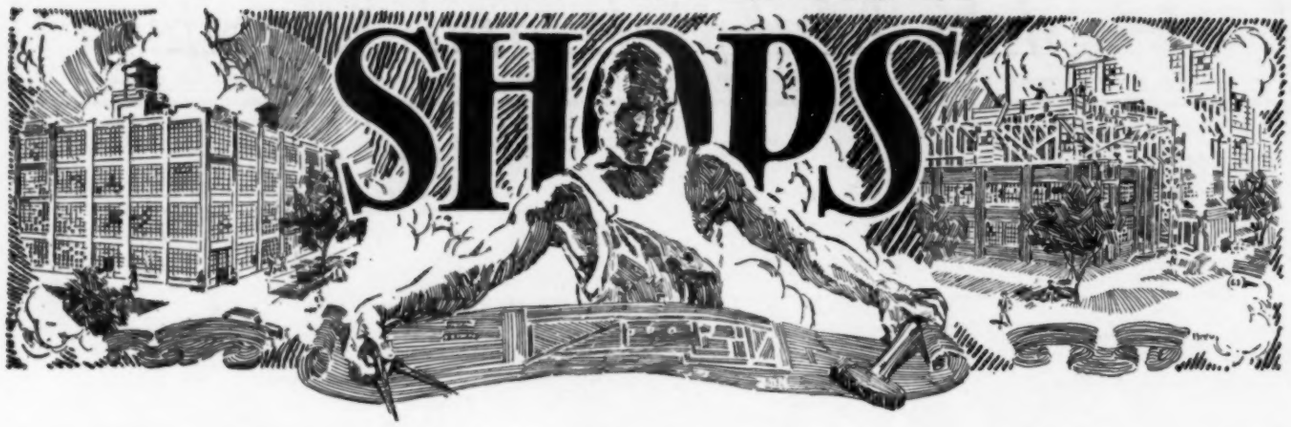
	New York	Cleveland	Chicago
Cotton waste, white, per lb	$0.07½@$0.10	$0.12	$0.12
Cotton waste, mixed, per lb	.055@.09	.09	.10
Wiping cloths per M., 13¼x13¼	.....	55.00	55.00
Wiping cloths per M., 13¼x20½	.....	65.00	65.00
Sal soda, 100 lbs	2.10	3.00	2.65
Roll sulphur, 2-bbl. lots per 100 lb	2.55	3.25	3.50
Linseed oil, per gal., 5 bbl. lots	.72	.77	.76
White lead, dry or in oil	100 lb. kegs.	New York, 12.25	
Red lead, dry	100 lb. kegs.	New York, 12.25	
Red lead, in oil	100 lb. kegs.	New York, 13.75	
Fire clay, per 75 lb. bag		.80	1.00
Coke, prompt furnace, Connellsville	per ton	$3.00@3.25	
Coke, prompt foundry, Connellsville	per ton	4.25@4.75	

SHOP SUPPLIES

Current Discounts from Standard Lists

	New York	Cleveland	Chicago
Machine Bolts:			
All sizes up to 1x30 in.	—50%	—60%	60-10-10%
1⅛ and 1¼x3 in. up to 12 in.	—40%	-60-10-10%	-60-10%
With cold punched sq. nuts	—30%	.....	....
With hot pressed hex. nuts up to 1x30 in. (plus std. extra of 10%)	—40%	.....	$4.00 off
Button head bolts, with hex. nuts	—20%	$3.90 net	.....
Hex. head and hex. nut bolts	—20%	.....	-65-5%
Lag screws, coach screws	—50–10%	.....	—60%
Carriage bolts, all sizes up to 1 in. x 30 in.	—45%	—50-10-10%	50–5%
Bolt ends, with hot pressed nuts	—50%	.....	—55%
Tap bolts, hex. heads	—20%	.....	.....
Semi-finished nuts all sizes	—70%	—75%	—80%
Case-hardened nuts	—60%	.....	.....
Washers, cast iron, ⅛ in., per 100 lb. Off list	$5.00	$5.50	$3.50 net
Washers, cast iron, ⅜ in. per 100 lb. Off list	4.25	3.75	3.50 net
Washers, round plate, per 100 lb. Off list	3.00	....	3.50 net
Nuts, hot pressed, sq., per 100 lb. Off list	2.00	3.00	4.00
Nuts, hot pressed, hex., per 100 lb. Off list	2.00	3.00	4.00
Nuts, cold punched, sq., per 100 lb. Off list	1.50	3.00	4.00
Nuts, cold punched, hex., per 100 lb. Off list	1.50	3.00	4.00
Rivets:			
Rivets, 7/16 in. dia. and smaller	—50-10%	60-10-10%	—65-5%
Rivets, tinned	—50-10%	60-10-10%	4½c. net
Button heads ¾-in., ⅞-in., 1x2 in. to 5 in., per 100 lb (net)	$3.70	3.50	3.43
Cone heads, ditto (net)	3.80	3.60	3.53
1⅛ to 1⅞-in. long, all diameters, *EXTRA* per 100 lb	0.25	.....	0.15
⅞ in. diameter *EXTRA*	0.15	.....	0.15
½ in. diameter *EXTRA*	0.50	.....	0.50
1 in. long, and shorter *EXTRA*	0.50	.....	0.50
Longer than 5 in. *EXTRA*	0.25	.....	0.25
Less than 200 lb. *EXTRA*	0.50	.....	0.50
Countersunk heads *EXTRA*	0.35	.....	$4.03 base
Copper rivets	—50–10%	—40-10%	—50-10%
Copper burs	—25–10%	—15%	—10%
Lard oil, pure, (50 gal. bbl.) per gal.	$0.90	$0.85	$0.90
Lard cutting oil (50 gal. bbl.) per gal.	0.60	0.50	0.55
Machine oil, lubricating, per gal.	0.45	0.35	.....
Belting—Present discounts from list in fair quantities (½ doz. rolls)			
Leather:			
Light grade	50–5%	50–5%	50–5%
Medium grade	45%	40–10–2½%	.....
Heavy grade	40%	40%	....
Rubber and duck:			
First grade	50–10%	50–10%	.....
Second grade	60–5%	60–5%	60–5%
Abrasive materials—In sheets 9x11 in.:			
No. 1 grade, per ream of 480 sheets,			
Flint paper	List $9.00 less 20-10-5%	50–10–5%'-20-10%	
Emery paper	List 11.00 less 20%	$11.00 net	-20%
Emery cloth	List 32.75 less 10%	32.75 net	-10%
Flint cloth, regular weight, width 3½ in., No. 1 grade, per 50 yd. roll, $4.50 net		.....	list+10%
Emery discs, 6 in. dia., No. 1 grade, per 100.			
Paper	List $1.65 less 20%	.....	-10%
Cloth	List $3.55 less 10%	.....	-10%

NEW *and* ENLARGED



Machine Tools and Machinery Wanted

Machine-tool wants published without charge

Conn., Bridgeport—The Genl. Mach. & Mfg. Co., 544 Irnstn Ave., J. Wilson, Purch. Agt.,—manufacturer of jigs, dies, metal stamping equipment—one No. 3 Waterbury Farrel Foundry Mach. Co. press.

N. Y., Cohoes—Cohoes High School, Dept. of Industrial Arts,—one engine lathe about 15 in. x 5 ft., one 2 hp. motor, 110 volt, 40 cycle, single phase, 1200 R. P. M., shafting, pulleys, hangers, belting, drills, reamers, taps and miscellaneous supplies.

Pa., Ellwood City—The Standard Eng. Co. 2nd St.—equipment including lathe, milling machine, shaper, grinder, etc.

Pa., Pittsburgh — The Western Penn. Penitentiary, Woods Run, N. S.—machine shop equipment, carpenter shop equipment, motors, shafting, etc.

La., New Orleans—The Janssens Auto Service, 3139 St. Claude St., E. Janssen, Prop.—auto repair shop equipment including jack, small auto lathe, small drill press, etc.

La., New Orleans—J. E. Lejeune, 3711 St. Claude St.—equipment for autc repair shop including drill press, small lathe, jack for hoisting autos, etc.

La., New Orleans—W. Reuther, 5305 St. Claude St.—auto repair and vulcanizing equipment, (new or used).

O., Galion—The Galion Iron Wks. & Mfg. Co., C. L. Flowers, Purch. Agt.—one 10 in. squaring shear to cut $\frac{7}{8}$ in.

Wis., Fond-du-lac—B. F. Sheridan, R. F. D. No. 6—auto repair shop equipment including lathe, press, etc.

Wis., Madison—The Bd. of Regents, University of Wisconsin, Administration Bldg., M. E. McCaffery, Secy.—equipment for machine and forge shops including lathes, presses, dies, etc.

Wis., Manitowoc—K. O. Muehlberg Co., 209 North 9th St.—lathes, punches, hammers, etc., for proposed machine shop.

Wis., Milwaukee—The Golden Electric Mfg. Co., 148 Reed St.—one 30 ton forcing press.

Wis., Neenah—The Tri-City Nash Co., 526 South Commercial St.—equipment for proposed garage on North Commercial St.

Ia., Davenport—The Nicholas Wire & Sheet Co., 1724 Rockingham Rd., H. Bourscheidt, Purch. Agt.—one wire straightener to cut and straighten rods up to and including $\frac{3}{8}$ in. diameter.

Mo., Sedalia—C. M. Byrd, 2319 South Ohio St.—machine tools including lathes, drill presses, motors, reamers, belts, pulleys, etc. for proposed lawn mower factory.

Pa., Philadelphia—The Corrugated Container Co., Trenton Ave. and Venango St., manufacturer of boxes and containers—one cut-off saw with table.

Pa., Philadelphia—**F. L.** Schlichinmoyer, 4810 North Broad St.—mixers, conveyors, etc. for proposed bakery.

Pa., Philadelphia — Wittman-Moriarity Co., Inc. Ontario Ave. and C St.—cutters, sewing machines, stamps, etc., for leather factory.

Pa., Philadelphia—The York Mfg. Co., (contractors,) 2222 Arch St.—general ice manufacturing machinery including ice crushers, grinders, etc. for the Franklinville Ice Co., 5166 Jefferson St.

Pa., Pottstown—Lockman & Murphy, Engrs., Drexel Bldg., Phila.,—ice manufacturing machinery for Burdan Bros., on 2nd St., here.

La., New Orleans — P. Forschler, Wagon and Mfg. Co., 2831 Burgunday St.—woodworking machinery and equipment including floor and post drills (about 20 in.), also bolt cutters up to 1¼ inches, emery wheels, etc.

Tenn., Knoxville—The Sanford-Day Iron Wks., Inc., Dale Ave.—one No. 4 or 5 Nazal air hammer.

W. Va., Wheeling—C. L. Hills, 403 Natl. Bank Bldg.—arc welding outfit for tank construction up to $\frac{7}{16}$ in. plate.

O., Columbus—W. L. Lillie Co., Sycamore St.—woodworking machinery for proposed factory.

O., Columbus—The State Dept. Pub. Welfare, Oak and 9th Sts.—will receive bids until Nov. 30 for an air compressor to be installed in the State Hospital at Massellon. Estimated cost, $6,000.

Wis., Madison—The F. F. F. Laundry Co., 731 East Dayton St., F. J. Lee, Secy.—laundry machinery and equipment.

Wis., Sheboygan—The Wisconsin Mirror Plate Co., 20th and Maryland St.—A. Hoenisberg, Pres.—special machinery for the manufacture of mirror plate.

Kan., Leavenworth—The Bd. Educ., c/o M. E. Moore, Supt.—manual training equipment for proposed junior high school.

Minn., St. Paul—The city will receive bids until Nov. 27 for an air compressor, gas engine driven, 140 cu.ft. per min., per 2 ton displacement.

Mo., Clinton—The Coco Cola Bottling Co., J. C. Marshall, Mgr.—bottling machinery for its plant near Public Sq.

Mo., Shelbina—B. G. Litly & Son—ice making machinery and ice tools.

Mo., Springfield—The Mapo Products Co.—machinery for canning and making candy.

S. D., Canton—The Bd. Educ., c/o C. Sandvig, Pres.—manual training equipment for proposed high school.

Ont., Chatham—Silverwoods, Ltd., A. E. Silverwood, Mgr.—ice cream and refrigeration equipment.

Metal Working Shops

NEW ENGLAND STATES

Conn., Bridgeport—The Crane Co., South Ave., manufacturer of valves, etc., is receiving bids for the construction of a 1 story, 75 x 175 ft. addition to its plant. Private plans.

Mass., Brockton—McRae, Ouderkirk & Hallamore Co., 159 North Montello St., has awarded the contract for the construction of a 1 story, 100 x 100 ft. garage on North Montello St. Estimated cost, $40,000.

Mass., Cambridge—C. N. James, 139 Brookline St., has awarded the contract for the construction of a 1 story, 99 x 122 ft. addition to his factory on Decatur St., for the manufacture of auto wheels. Estimated cost, $45,000.

Mass., Willimansett—The Hampden Motor Truck Co., Holyoke, will soon award the contract for the construction of a 1 story, 60 x 630 ft. motor truck factory along the tracks of the Boston & Maine R.R., here.

Mass., Worcester—T. O. Flynn & Sons, 8 Green St., are having plans prepared for the construction of a 2 story, 40 x 90 ft. garage on Green St. Estimated cost, $40,000. E. T. Chapin, 340 Main St., Archt.

MIDDLE ATLANTIC STATES

Pa., Clarion—L. A. Leathers, Brookville, has awarded the contract for the construction of a 1 story, 60 x 110 ft. garage here. Estimated cost, $50,000.

Pa., Ellwood City—The Ellwood City Forge Co., 10th St., has had plans prepared for the construction of a forge plant.

Pa., Ellwood City—The Pittsburgh Malleable Iron Co., 34th and Smallman Sts., Pittsburgh, plans to build a 1 story plant, here. Architect not selected.

Pa., Indiana—Raylo Co., 1228 Fulton Bldg., Pittsburgh, will soon receive bids for the construction of a 4 story, 50 x 120 ft. factory on Philadelphia St. here, for the manufacture of mechanical specialties. Estimated cost, $85,000. Private plans.

Pa., Philadelphia — J. E. Fieldstein, Archt., Penfield Bldg., will receive bids until Dec. 1 for the construction of a 3 story, 89 x 100 ft. garage and service station on Broad St. and Bainbridge Ave., for the Walton Auto Supplies Co., Inc.

SOUTHERN STATES

W. Va., Huntington—The Chesapeake & Ohio R.R. plans to build an addition to its car and locomotive shops, here. Estimated cost, $65,000. H. Frazier, Richmond, Va., Consul. Engr.

W. Va., Huntington—H. T. Lambert Co., 718 1st Natl. Bank Bldg., recently incorporated with $200,000 capital stock, plans to construct plant for the manufacture of frogs, switches and other rail equipment. Estimated cost, $45,000. A. E. Thomas, Treas.

W. Va., Nitro—E. P. Bailey Co. has had plans prepared for the construction of a 1 story foundry and machine shop. Estimated cost, including machinery, $100,000. Private plans.

W. Va., Point Pleasant—The Auto Motive Mfg. Co., Dunbar, has awarded the contract for the construction of a 1 story, 80 x 250 ft. plant here. Estimated cost, $90,000.

MIDDLE WEST STATES

Ill., Chicago—H. E. Forke, 3261 Fullerton Ave., has awarded the contract for the construction of a 1 story, 50 x 125 ft. garage and auto repair shop on Milwaukee St. near Logan Square. Estimated cost, $40,000.

Ill., Chicago—Mandel Bros., State and Madison Sts., have awarded the contract for the construction of a 1 story, 125 x 191 ft. garage at 2641-59 North Crawford St. Estimated cost, $75,000.

Ill., Chicago—The Rienzi Garage Co., 554 Diversey Ave., is having plans prepared for the construction of a 1 story, 117 x 230 ft. garage on Dole Ave. and Lehmann Court. Estimated cost, $100,000. W. W. Ahlschlager, 65 East Huron St., Archt.

Ill., Elgin—The Duty Motor Corp., c/o W. H. Reuther, Pres., 19 North Spring St., has awarded the contract for the construction of a 1 story, 250 x 250 ft. factory for the manufacture of auto trucks. Estimated cost, $80,000.

Ill., Elgin—Woodruff & Edwards will soon award the contract for the construction of a 3 story, 50 x 100 ft. foundry. Estimated cost, $51,000. Private plans.

O., Cleveland—Lamson & Sessions Co., 2188 Scranton Rd., manufacturer of nuts and bolts, has awarded the contract for the construction of a 2 story, 64 x 110 ft. factory on Scranton Rd. Estimated cost, $60,000.

O., Cleveland—J. C. Lincoln Pres. of the Lincoln Electric Co., East 38th St. and Kelly Ave., plans to build a 1 story, 60 x 110 ft. garage at 1627 Superior Ave. Estimated cost, $50,000. Architect not selected.

O., Cleveland—W. Rosenzweig, Society for Savings Bldg., plans to build a 1 story garage at the rear of 6535 Carnegie Ave. Estimated cost, $50,000. Private plans.

O., Minerva—The Lewis Electric Co. has awarded the contract for the construction of a 1 story, 90 x 200 ft. factory. Estimated cost, $100,000.

Wis., Appleton—The West End Auto Co., 476 South St., has awarded the contract for the construction of a 1 story, 42 x 120 ft. garage on College Ave. Estimated cost, $40,000.

Wis., Burlington—M. F. White, Archt., 68 Wisconsin St., Milwaukee, is receiving bids for the construction of a 1 story, 68 x 134 ft. garage, for J. A. Luke, Burlington. Estimated cost, $40,000.

Wis., Manitowoc—K. O. Muehlberg Co., 209 North 9th St. has awarded the contract for the construction of a 2 story, 65 x 95 ft. machine shop. Estimated cost, $50,000.

Wis., Milwaukee—The Alliance Investment Co., 115 Wisconsin Ct., is having plans prepared for the construction of a 1 story, 60 x 120 ft. garage on Broadway. Estimated cost, $40,000. M. Tullgren & Sons, 425 East Water St., Archts.

Wis., Neenah—The Tri-City Nash Co., 526 South Commercial St., purchased a site and plans to build a 2 story, 55 x 150 ft. garage on North Commercial St. Estimated cost, $60,000. Architect not selected.

Wis., Platteville—B. A. Doescher plans to build a 2 story, 60 x 150 ft. factory for the manufacture of electrically operated lantern for advertising purposes. Estimated cost, $50,000. Architect not selected.

Wis., Prairie du Sac—Schmalz Bros. have awarded the contract for the construction of a 1 story, 60 x 106 ft. garage. Estimated cost, $40,000.

WEST OF THE MISSISSIPPI

Kan., Columbus—C. & A. Motor Car Co., c/o F. Hart, Mgr., plans to build a 2 story garage. Estimated cost, $50,000. Architect not selected.

Kan., Wichita—The Legeli Engine Co., c/o L. Legeli El Reno, Okla., plans to construct a 2 story factory here. Estimated cost, $50,000. Architect not selected.

Mo., Sedalia—C. M. Byrd, 2319 South Ohio St., plans to build a 1 story factory for the manufacture of lawn mowers. Architect not selected.

Mo., St. Louis—The Adalil Realty Co., c/o P. H. Bierman, 1609 Ry. Exch. Bldg., is having plans prepared for the construction of a 1 story, 50 x 234 ft. garage on Spring and Washington Sts. Estimated cost, $55,000. O. J. Popp, Odd Fellows Bldg., Archt.

Mo., St. Louis—The Automobile Garage Co. has awarded the contract for the construction of a 1 story, 100 x 129 ft. garage on Easton and Valle Aves. Estimated cost, $40,000.

Mo., St. Louis—The Haynes Langenberg Mfg. Co., c/o G. Langenberg, plans to construct a 2 story factory on Forest Park Terrace, for the manufacture of furnaces. Estimated cost, $125,000. Architect not selected.

Mo., St. Louis—The Missouri Pacific R.R., c/o B. F. Bush, Pres., Exch. Bldg., has awarded the contract for the construction of a 1 story, 46 x 500 ft. car repair shop on 21st St. Estimated cost, $125,000. Noted Nov. 17.

Mo., St. Louis—The Walsh Motor Car Co., 4919 Delmar St., is having plans prepared for the construction of a 2 story garage. Estimated cost, $75,000. W. D. Walsh, Pres. Cornet & Casey, Chemical Bldg., St. Louis, Mo., Archt. Noted May 5.

Okla., Cordell—C. H. Murdock is receiving bids for the construction of a 2 story, 50 x 130 ft. garage. Estimated cost, $45,000. Layton, Smith & Forsyth, 701 Majestic Bldg., Oklahoma City, archts.

WESTERN STATES

Cal., Irvington—Reid Bros., 105 Montgomery St., San Francisco, manufacturers of surgical supplies, are having plans prepared for the construction of a 1 story factory here. Estimated cost, $100,000. Sutton & Whitney, Lewis Bldg., Portland, Ore., Archts.

Cal., Long Beach—The Kimball Motor Truck Co., 1700 East 9th St., is having plans prepared for the construction of a 3 story auto truck factory on West Aneheim Blvd. Estimated cost, $350,000. Private plans.

Cal., Los Angeles—The Kittle Mfg. Co., 643 Santa Fe Ave., has awarded the contract for the construction of a 1 story, 140 x 160 ft. factory for the manufacture of auto accessories. Estimated cost, $40,000.

Ore., Scappoose—The Oregon Charcoal Iron Co., 412-13 Corbett Bldg., Portland, is having plans prepared for the construction of a 50-ton charcoal blast furnace supplied by a by-products plant, 1½ mi. west of here. C. I. Calkins, Pres.

Wash., Seattle—E. Goldberg, 615 Boren Ave., is having plans prepared for the construction of a 2 story, 138 x 160 ft. industrial building. Estimated cost, $60,000. Kilbourne-Clark Mfg. Co., Spokane and East Marginal Way, manufacturers of electrical apparatus, including wireless sets, etc., lessee.

CANADA

Ont., Brockville—The J. R. Baxter Co., Ltd., 102 St. Antoine St., is having plans prepared for the construction of a 50 x 200 ft. grinding wheel factory on Pearl St., E. Estimated cost, $25,000. J. A. Johnston, Brockville, archt.

Ont., Toronto — The Gotfredson-Joyce Corp., Ltd., Walkerville, plans to build a 2 story garage and service station, etc., on Spadina Ave. here. Estimated cost, $100,000. W. H. Leishman, 106 Jarves St., Toronto mgr.

General Manufacturing

NEW ENGLAND STATES

Conn., Hartford—The Frisbie Pie Co., Kossuth and Burroughs Sts., Bridgeport, is receiving bids for the construction of a 2 story, 100 x 100 ft. bakery, etc., including a warehouse, on Prospect St., here. Private plans.

Conn., Hartford—St. Francis Hospital, Farmington Ave., has awarded the contract for the construction of a 1 story, 80 x 90 ft. laundry on Ashley St. Estimated cost, $40,000.

Conn., Stamford—The Vogue Publishing Co., 19 West 44th St., New York, is having sketches made for the construction of a 3 story, 75 x 100 ft. printing plant, on Boston Post Rd., here. Estimated cost, $85,000. W. Higginson, 18 East 41st St., New York, Archt. and Engr.

Mass., Walpole—Bird & Son have awarded the contract for the construction of a 1 story, 65 x 210 ft. addition to their paper factory. Estimated cost, $60,000.

R. I., Pawtucket—J. and P. Coats, Inc., 366 Pine St., plan to build an addition to their thread mill. Architect not announced.

MIDDLE ATLANTIC STATES

D. C., Washington—Fleishmann Yeast Co., Longdon, has awarded the contract for altering and building an addition to its yeast plant. Estimated cost, $50,000.

N. J., El Moro (Elizabeth P. O.)—The Amer. Type Fdry. Co., Communipaw Ave., Jersey City, plans to build a type foundry here. W. Kelly, Westfield, Mgr.

N. Y., Mt. Vernon—The Willow Brook Dairy Co., 5 South Fulton Ave., has awarded the contract for the construction of a 1 and 2 story, dairy and garage. Estimated cost, $300,000. Noted June 23.

Pa., Philadelphia—The Franklinville Ice Co. has awarded the contract for the construction of an addition to its ice factory at 5166 Jefferson St. Estimated cost, $38,000.

Pa., Philadelphia—The Producers' Cold Storage Co., c/o W. C. Benkert, is having preliminary plans prepared for the construction of a 10 story, 90x275 ft. cold storage plant on South and Bainbridge Sts. Estimated cost, $2,000,000. A. J. Sauer & Co., Denkla Bldg., Engrs.

Pa., Philadelphia—F. L. Schlichinmoyer, 4810 North Broad St., has awarded the contract for the construction of a 2 story, 40 x 84 ft. bakery on Courtland Ave. and 15th St. Estimated cost, $18,000.

Pa., Philadelphia — Wittman-Moriarity Co., Inc., has awarded the contract for the construction of a 2 story, 77 x 195 ft. and a 1 story, 72 x 111 ft. additions to leather factory on Ontario Ave. and C St. Estimated cost, $100,000.

Pa., Pittsburgh—H. J. Heinz Co. (pickling and preserving plant), is having plans prepared for the construction of a 6 story, 92 x 150 ft. manufacturing and storage building on Progress St. R. M. Trimble, Ferguson Bldg., Archt.

Pa., Pottstown—Burdan Bros., 2nd St., will soon award the contract for the construction of a 4 story, 100 x 260 ft. ice cream factory. Estimated cost, $125,000. Lockman & Murphy, Drexel Bldg., Phila., Archts. and Engrs.

SOUTHERN STATES

Ky., Ashland—The Imperial Ice Cream Co., Parkersburg, has awarded the contract for the construction of a 1 story, 46 x 166 ft. ice cream plant here. Estimated cost, $90,000.

Ky., Louisville—The Van Camp Packing Co., 1303 South Shelby St., has awarded the contract for the construction of 2 canned food product factories, each 2 story, 102 x 275 ft., on Shelby St. and Goss Ave. Estimated cost, $400,000.

Ky., Louisville—The Standard Sanitary Mfg. Co. is having plans prepared for the construction of a 1 story, 53 x 404 ft. enameling plant on 6th and A Sts. Estimated cost, $80,000. O. P. Ward, Lincoln Bldg., Archt.

N. C., Gastonia—The Loray Mills, Jenckes Spinning Co., has awarded the contract for the construction of a 1 story addition to its mill. Estimated cost, $50,000.

La., New Orleans—P. Forschler Wagon & Mfg. Co. plans to build and equip a temporary plant at 2831 Burgundy St. The old plant at 610 Montegut St., which was destroyed by fire will be rebuilt. J. A. Maschek, Mgr.

N. C., Gastonia—The Spencer Mountain Mills will soon award the contract for the construction of a 1 story, 56 x 64 ft. addition to cotton mill. Lockwood, Greene & Co., Charlotte, Archts.

W. Va., Huntington—The Imperial Ice Cream Co., Parkersburg, has awarded the contract for the construction of a 2 story, 45 x 83 ft., and a 1 story, 40 x 60 ft., ice cream plant, here. Estimated cost, $75,000.

MIDDLE WEST STATES

Ill., Canton—The Canton Ledger Newspaper, c/o H. Owen, Mgr., is having plans prepared for the construction of a 2 story printing shop. Estimated cost, $50,000. Reeves & Ballie, Arcade Bldg., Peoria, Archts.

Ill., Chicago—The Vienna Model Bakery, 1040 Vernon Park, will soon award the contract for the construction of a 3 story bakery. Estimated cost, $150,000. The McCormick Co., Century Bldg., Pittsburgh, Pa., Archts.

Ill., Jacksonville—The International Shoe Co., 1505 Washington St., St. Louis, Mo., is having plans prepared for the construction of a 3 story factory here. Estimated cost, $50,000.

Ill., Joliet—The Suburban Ice Co., c/o L. E. Stanley, Pres., La Grange, will build a 100 ton capacity ice plant, here. Estimated cost, $60,000.

Ill., La Salle—F. Worn is interested in a stock company which plans to build a cement plant. Estimated cost, $40,000. Architect not selected.

Ill., Zeigler—The Zeigler Ice & Bottling Co. plans to build a 1 story, 92 x 92 ft. ice plant. Estimated cost, $50,000. Architect not selected.

Mich., Detroit—The Curtis Co., 536 West Lafayette Ave., is having plans prepared for the construction of a 3 story printing plant on West Grand Blvd. and Lincoln Ave. Estimated cost, $150,000. Smith Hinchman & Grylls, 710 Washington Arcade, Archts.

Mich., Grand Rapids—The Kent Storage Co., Front St., N.W., plans to build a cold storage plant. G. H. Hess, ch. Engr.

O., Canton—The Canton Ice Delivery Co., 601 4th Ave., N. E., has awarded the contract for the construction of a 1 story, 80 x 92 ft. ice plant. Estimated cost $100,000.

O., Cleveland—The Billings-Chapin Co., 1163 East 40th St., manufacturer of paint, is having plans prepared for the construction of a 4 story, 80 x 110 ft., factory on East 40th St. Estimated cost, $250,000. Lockwood, Green & Co., 1566 Hanna Bldg., Archts.

O., Cleveland—The Federal Knitting Co., 2882 Detroit Ave., has awarded the contract for the construction of a 3 story, 65 x 85 ft. factory on West 29th St. and Detroit Ave. Estimated cost, $60,000.

O., Columbus—W. L. Lillie Co., 255 Sycamore St., will receive bids about Jan. 1 for the construction of a 2 story, 40 x 250 ft. addition to its woodworking factory. Estimated cost, $100,000. J. B. Powell, 1455 Eastwood Ave., Archt.

O., East Palestine—The Natl. Fireproofing Co., 1126 Fulton Bldg., Pittsburgh, is having plans prepared for the construction of a 1 story, 100 x 100 ft. brick plant, here. Estimated cost, $60,000. S. F. Heckert, Bessemer Bldg., Pittsburgh, Archt.

O., Newark—The Consumers' Products Co. is receiving bids for the construction of a 1 story, 40 x 60 ft. ice plant. Estimated cost, $40,000. A. C. Bishop & Co., 327 Guardian Bldg., Cleveland, Archts.

Wis., Cedarburg—J. J. Wittenberg plans to build a 2 story, 60 x 85 ft. tire factory on Main St. Estimated cost, $35,000. Private plans.

Wis., Cumberland — The Cumberland Creamery Co. will receive bids until Jan. 1 for the construction of a 1 and 2 story, 50 x 100 ft. dairy. Estimated cost, $15,000. Private plans.

Wis., Maribel—The Maribel Strawcutter Co. will build a 1 and 2 story, 50 x 120 ft., factory. Estimated cost $45,000. Noted Sept. 15.

Wis., Milwaukee—F. C. Gross Bros. Co., 133 Muskego Ave., will build a 1 and 2 story, 56 x 145 ft. cold storage plant and warehouse on Muskego Ave. Estimated cost, $40,000.

Wis., Milwaukee—The Gugler Litho Co., 694 Bway., has awarded the contract for the construction of a 1 story, 66 x 106 ft. addition to its lithographing plant. Estimated cost, $60,000.

Wis., Milwaukee—H. C. Haeuser, Archt., 445 Milwaukee St., will open bids about Nov. 21 for the construction of a 2 story, 32 x 64 ft. bakery on North Ave., for H. M. Schwantes, 1063 16th St. Estimated cost, $40,000.

Wis., Portage—The Portage Co-Operative Canning Co., Michel Bldg., is having plans prepared for the construction of a 2 story, 198 x 250 ft. cannery. Estimated cost, $150,000. R. A. Webber, Portage, Archt. Noted Sept. 15.

Wis., Sheboygan—The Wisconsin Mirror Plate Co., 20th and Maryland St., has had plans prepared for the construction of a 2 story, 60 x 118 ft. mirror factory on Indiana Ave. Estimated cost, $150,000. W. C. Weeks, 720 Ontario St., Archt.

Wis., Stoughton—The Stoughton Wagon Co. plans to build a 1 and 2 story, 75 x 210 ft. factory on Main St., to replace the one which was recently destroyed by fire. Estimated cost, $300,000. F. J. Vea, Mgr. Architect not selected.

Wis., Waukesha—The Commercial Appliance Co., c/o L. M. Taylor, Pres., Port Washington, has purchased a site and plans to build a 2 story, 50 x 150 ft. factory on Main St. Estimated cost, $75,000. Architect not selected.

WEST OF THE MISSISSIPPI

Col., Denver—J. J. Hoffman, 491 South Penn St., has purchased a site and plans to build a 1 story packing plant on York and 50th Sts., next spring. Estimated cost, $30,000. A. Breuner, Denver, Archt.

Growing

Last July we announced that we had published in that month the names, addresses and requirements of 133 concerns in the market for

Machine Tools and Machinery

In November the number of these items published was

189

This service is both expensive and difficult to maintain, but we have reason to believe that it is of value to the readers of the *American Machinist*, and is appreciated by them.

These leads are not easy to obtain, even by our carefully instructed field force. Our men are instructed to verify beyond doubt every item of information reported for publication in these columns.

If you are in the market, or if any of your friends are in need of new equipment, take advantage of our

Machine-Tool and Machinery Exchange

Minn., Minneapolis—The Minnesota Mfg. Corp., 732 3rd St., N., is having plans prepared for the construction of a 3 story, 46 x 132 ft. factory, on 8th Ave., between 3rd and 4th Sts., N., for the manufacture of cleansing powder. Estimated cost, $40,000. E. J. Miller, Secy. P. E. Crosier, 915 New York Life Bldg., Archt.

Mo., Aurora—The Helvetia Milk Co. plans to construct a 2 story milk condensery. Estimated cost, $200,000. J. A. Potter, representative. Architect not selected.

Mo., Clinton—The Coco Cola Bottling Co. has had plans prepared for the constructoin of a 1 story addition to its bottling works near Public Sq. Estimated cost, $5,000. J. C. Marshall, Mgr.

Mo., Ferguson—The Republic Photographic Co., Kansas City, has awarded the contract for the construction of a 1 story factory. Estimated cost, $125,000. Noted Nov. 3.

Mo., Joplin—A. B. Thomas Fruit Co., 7th and Virginia Sts., is having plans prepared for the construction of a 4 story, 120 x 150 ft. cold storage plant on 6th and Virginia Sts. Estimated cost, $100,000. A. B. Thomas, Mgr. Private plans.

Mo., Kansas City—The Valatia Mills, manufacturers of cotton bags, have awarded the contract for the construction of a 3 story, 50 x 113 ft. factory on 15th and Campbell Sts. Estimated cost, $100,000.

Mo., Poplar Bluff—C. Weipuetz Bakery Co., Cape Girardeau, is having plans prepared for the construction of a 2 story bakery at 205 Poplar St., here. Estimated cost, $50,000. A. Weilpuetz, local mgr. Private plans.

Mo., Springfield—The Bromide White Lime Co., Woodruff Bldg., plans to construct a 2 story lime factory near the city limits. Estimated cost, $50,000. D. P. Klepinger, Secy. Architect not selected.

Mo., Shelbina—B. G. Litly & Son plan to construct a 1 story ice plant. Estimated cost, $30,000. Architect not selected.

Mo., Springfield—The Mapo Products Co. plans to build a factory for the manufacture of candy and syrups. Estimated cost, $12,000. Architect not selected.

Mo., St. Joseph—The Natl. Biscuit Co., c/o W. J. Rainalter, Mgr., Main and Jule Sts., will soon award the contract for the construction of a 2 story factory. Estimated cost, $35,000. Eckel & Aldrich, Forsee Bldg., Archts.

Mo., St. Louis—O. E. Schaefer, 1122 McCausland St., will soon award the contract for the construction of a 1 story, 82 x 126 ft. factory on LaSalle and Grand Sts. Estimated cost, $45,000. F. B. Edelmann, Title Guaranty Bldg., Archt.

Mo., St. Louis—The Scott Dying & Cleaning Co., c/o M. A. Hartsman, Pres., 3829 Olive St., is having plans prepared for the construction of a 2 story, 58 x 160 ft. dying and cleaning plant on Olive St. Estimated cost, $75,000. H. P. Hess, 4811 Cote Brilliante St., Archt.

WESTERN STATES

Cal., San Diego—The Bd. Educ., Guarantee Title Bldg., is having preliminary plans prepared for the construction of a training shop, etc., in City Park. Estimated 2 story high school, including a manual cost, $300,000. T. C. Kistner, 307 Bancroft Bldg., Archt.

Cal., San Diego—The San Diego Ice and Cold Storage Co., 110 9th St., will build a 5 story, 105 x 158 ft. cold storage plant, including 2 ice tanks, 60 ton capacity each and engine room, 8th, 9th, N. and Imperial Sts. Estimated cost, $300,000. F. P. Allen, 1st Natl. Bank Bldg., Archt.

Ore., Portland—The Doernbecker Mfg. Co. is having plans prepared for the construction of a 6 story chair factory on East 28th St., along tracks of Oregon-Washington R.R. & Navigation Co. Estimated cost, $500,000. M. Patterson, c/o owner, Engr.

CANADA

Ont., Bowmanville—The Ontario Potteries, Ltd. preparing plans for pottery plant. Estimated cost, $50,000. J. W. Black, Mgr. Private plans.

Ont., Chatham—Silverwoods, Ltd., London, is having plans prepared for the construction of an ice plant, on Maple St., here. Estimated cost, $100,000. A. E. Silverwood, Mgr. Private plans.

Ont., Toronto—Chapmans, Ltd., Kent Bldg., has awarded the contract for the construction of an artificial ice plant. Estimated cost, $70,000.